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LEONA QUARRY

Draft Environmental Impact Report

Prepared for the
CITY OF OAKLAND

by EIP Associates

February 26, 1987

File No. ER 86-1
Ref. No. CM 80-425, CM 87-32

City of Oakland
Oakland, California

DRAFT ENVIRONMENTAL IMPACT REPORT FOR:
Leona Quarry - Reclamation Plan and Use Extension
(Project Name)
California Environmental Quality Act (CEQA)

RELEASE OF REPORT FOR PUBLIC REVIEW

The City of Oakland is hereby releasing this draft Environmental Impact Report (EIR), finding it to be accurate and complete and ready for public review. Members of the public are invited to respond to the EIR. Comments should focus on the sufficiency of the EIR in discussing possible impacts on the environment, ways in which adverse effects might be minimized, and alternatives to the project in light of the EIR's purpose to provide useful and accurate information about such factors. Please address all comments to the Oakland City Planning Commission, 6th Floor, City Hall, One City Hall Plaza, Oakland, California, 94612. Comments should be received no later than April 4, 1987.

- [x] The City Planning Commission will conduct a public hearing on the draft EIR on April 1,1987 at 1:30 p.m. in Room 115, City Hall.
- [x] After all comments are received, a final EIR will be prepared and considered for acceptance by the City Planning Commission on April 29, 1987 at 1:30 p.m. in Room 115, City Hall.
- [ ] The draft EIR is attached.
- [ ] The draft EIR is available at the City Planning Department.

If you have any questions, please telephone the City Planning Department at 273- 3941. Ask for Frank Ehrhardt.

Alvin D. James

ALVIN D. JAMES
Director of City Planning

DATE: February 26, 1987

File No. ER 86-1
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City of Oakland
Oakland, California

DRAFT ENVIRONMENTAL IMPACT REPORT FOR:
Leona Quarry
(Project name)
California Environmental Quality Act (CEQA)

SUMMARY

A. GENERAL INFORMATION

Project Title Leona Quarry

Location east of I-580 at Edwards Avenue

Project Sponsor Gallagher & Burk, Inc.

Address 344 High St., Oakland, CA 94601

B. PROJECT DESCRIPTION: Application for a Conditional Use Permit and Reclamation Plan for continued operation of the Leona Quarry.

C. SUMMARY OF ENVIRONMENTAL CONSEQUENCES OF THE PROJECT:

See Chapter 1, page 1-1.

D. POSSIBLE MITIGATION MEASURES TO MINIMIZE ANY ADVERSE EFFECTS OF THE PROJECT:

Geology, page 4-5
Hydrology & Water Quality, page 4-21
Vegetation & Wildlife, page 4-30
Visual Quality, page 4-36
Land Use, page 4-40
Transportation, page 4-44
Air Quality, page 4-50
Noise, page 4-52
Public Safety, page 4-56
Socioeconomics, page 4-62

E. AGENCIES, ORGANIZATIONS AND INDIVIDUALS CONSULTED:

See Chapter 7

F. PUBLIC AGENCIES HAVING JURISDICTION BY LAW OVER THE PROJECT:

City of Oakland

G. PRELIMINARY DRAFT EIR PREPARED BY:

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Oakland, CA 94612
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Oakland, CA 94612
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DATE COMPLETED:

February 27, 1987

LEONA QUARRY

DRAFT ENVIRONMENTAL IMPACT REPORT

Prepared for the

CITY OF OAKLAND

Prepared by

EIP ASSOCIATES
319 Eleventh Street
San Francisco, California 94103

February 26, 1987

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1 SUMMARY

1.1 PROJECT DESCRIPTION

The Leona Quarry has been in continuous operation since 1910. The 125 acre site is located in the hills of Oakland at 7100 Mountain Boulevard, bounded by I-580 on the southwest, steeply sloping open space on the northwest with new residential development along the ridges, the extension of Campus Drive on the northeast, and steeply sloping open space with scattered residential development at the lower elevations on the southeast. Gallagher & Burk, Inc., owner and operator of the quarry, is requesting approval of a Conditional Use Permit to continue operation of the quarry through the year 2027.

No increases in annual production are anticipated at the quarry, and operations are planned to continue as at present, consisting of ripping and dozing of the rock, with some drilling and blasting as necessary, and screening, crushing, sorting, and stockpiling of final product. In compliance with the State Mining and Reclamation Act (SMARA) of 1977, the applicant has submitted a Reclamation Plan for the potential use and configuration of the site after site closure. Reclamation will be concurrent with quarrying; as final slope grades are attained on portions of the site, revegetation treatment will be applied prior to the winter rains.

No specific uses are proposed for the reclaimed site, however, the current General Plan would permit only residential or open space uses on the site.

1.2 GEOLOGY

1.2.1 SETTING

The Leona Quarry occupies approximately 125 acres of a southwest-facing slope in the

Oakland Hills. This site was designated as a Regionally Significant Construction Aggregate Resource by the State Mining and Geology Board in 1985. An area of "regional significance" is a sector which is known to contain a deposit of minerals, the extraction of which is judged to be of prime importance in meeting future needs of minerals in the surrounding region and which, if prematurely developed for alternative incompatible land uses, could result in the permanent loss of minerals that are of more than local significance. The Leona Quarry contains rhyolite which is used for asphaltic concrete aggregate and road base material.

The site is located in a seismically active region, but there are no known active or potentially active faults on the project site. The site is located approximately 1,000 feet east of the Alquist-Priolo Special Studies Zone of the Hayward Fault.

The topography of the site consists primarily of manmade temporary working slopes up to 50 degrees, while natural slopes adjacent to the site are up to 35 degrees. Elevations range from 300 to 1,070 feet above mean sea level. Both recent and ancient landslides occur within and adjacent to the quarry. The landslides in the quarry resulted from a combination of factors including high porewater pressure, adversely oriented geologic structure and strong weathering.

1.2.2 IMPACTS

The major geologic hazard associated with continued operation of the quarry is the potential instability of the slope faces as a result of seismically induced groundshaking or over-steepening of quarry faces, both of which would be aggravated by the presence of water trapped within the quarry walls. If major slope failures were to occur during or after quarry operations, adjacent residential properties could be affected.

1.2.3 MITIGATION

Geotechnical recommendations developed by Golder Associates for the correction of slope instability and for the repair and prevention of landslides are incorporated in their 1986 Leona Quarry Geotechnical Reclamation Design. Briefly, landslide prevention recommendations include final slope specifications to ensure stability in soil, weathered rhyolite, and fresh rhyolite, ensuring adequate drainage to prevent buildup of pore water

pressure behind final slope faces, minimizing blast damage as final slope is approached, installation of slope monitoring instruments along the crest of the quarry, and phased revegetation to assist in final slope stabilization and erosion control. It is also recommended that performance standards for revegetation be developed prior to reclamation efforts to ensure that the revegetation program is effective in minimizing erosion and stabilizing final slopes. Recommendations for repair of the existing landslide areas in the quarry include installation of subdrains to relieve pore water pressure, benching and draining of the headwalls and flanks of the slides, installation of a welded wire retaining wall to stabilize the 1970 slide, and lowering of existing scarps by limited grading.

1.3 HYDROLOGY AND WATER QUALITY

1.3.1 Setting

The project property drains from the north, east, and south into the quarry. It then drains overland to existing storm water pickup points along Mountain Boulevard where it enters the City storm drain system. The city system connects to the Alameda County Flood Control system at Sunnyside Road. The site receives approximately 25 inches of rain per year.

There are four stormwater siltation ponds located below the quarry plant area, which drain from pond to pond by a pipe system set through the pond dikes. Maintenance of the ponds is on an as-needed basis. Changes in the storm drainage system have been proposed in order to meet the SMARA requirements for erosion and sediment control. These changes include installation of final drainage systems as final slopes are attained and design and installation of a final sedimentation and stormwater retention basin at the toe of the quarry face. Depressurization systems would also be installed to reduce buildup of pore water pressure within the rock formation to maintain slope stability.

The quarry primarily contributes silt to the water contaminant load. Oil changes and other equipment maintenance is done in a sealed catchment area from which residue is periodically collected and trucked offsite to be recycled.

1.3.2 IMPACTS

Storm drainage, erosion/siltation, and water quality control impacts are closely related. Because the only major constituent of the water contaminant load produced by the quarry is the sediment produced by the mining operation itself, the only impacts which might arise would be increased stormwater turbidity. Because no increase in the amount of material to be mined annually is proposed, no increases in sediment load entering the stormwater system are anticipated.

1.3.3 MITIGATION

The potential contribution from the quarry to the contaminant load is sediment. The project sponsor's proposed drainage modifications and revegetation plans would fulfill the requirements of SMARA for retention of sediment on-site. The groundwater depressurization measures proposed to alleviate pore water pressure buildup and ensure slope stability will increase the quantity of water entering the stormwater system, but the increased volume will be a fraction of a percent and does not constitute a major impact.

1.4 VEGETATION AND WILDLIFE

1.4.1 SETTING

Leona Quarry is part of a typical semi-coastal foothill landscape characterized by several natural plant communities. Habitats represented include Oak Woodland, Grassland, Chaparral, Riparian, and disturbed plant communities. The quarry site itself has sparse vegetation due to the historic quarrying operations, and as a result, the site is visually prominent from many vantages in the Bay Area. Several pockets of riparian vegetation on the site provide limited wildlife habitat.

Reclamation plans for the site include extensive revegetation to create long-term semi-natural vegetative cover on the final slopes. The primary objective is to establish a viable plant community which will visually soften the quarry's appearance.

1.4.2 IMPACTS

The proposed revegetation plan will soften the visual impact of the final quarry slopes and enhance wildlife values, since plants to be used are typical of the surrounding habitat

types. Drought stress, particularly on south-facing slopes, is anticipated to be the most likely factor influencing the success of the revegetation plan.

1.4.3 MITIGATION

The revegetation plan is the primary mitigation proposed for the site, and includes mitigation for visual, biotic, and slope stability impacts. Additional mitigation is recommended for drier, south-facing slopes subject to drought stress. Species used in revegetation of such slopes should be drought resistant, and a limited irrigation plan should be considered for areas with the greatest need.

1.5 VISUAL QUALITY

1.5.1 SETTING

The quarry faces southwest on the western ridge of the Oakland Hills. This orientation faces many square miles of view-shed extending westward from I-580, outward over the Oakland Bay plain, and toward the San Francisco peninsula beyond. Of the 125 acres comprising the total site, about 79 acres will be quarries, and 89 acres are proposed for reclamation by revegetation or future development. In its present condition, the site would not be considered visually attractive. It is visually discordant with its surroundings because of the marked contrast between the light color of the exposed rock and the surrounding plant communities, as well as the unnatural steepness of the cut slopes.

1.5.2 IMPACTS

The project includes a proposed reclamation plan which consists of final site grading, erosion control, and revegetation. Final site grading would create benches at regular intervals to stabilize cut slopes and facilitate revegetation. Revegetation would greatly reduce the color contrast with the surrounding natural habitat areas. The visual quality of the site would gradually improve as revegetation proceeded, and subsequent development of the site would improve the visual quality by blocking views of the cut slopes.

1.5.3 MITIGATION

The existing plantings along the western property boundary fronting I-580 should be supplemented with additional plantings to produce a denser evergreen screen between the

site and the freeway. No other mitigation is proposed or necessary if the revegetation plan is properly implemented.

1.6 LAND USE

1.6.1 SETTING

Leona Quarry is situated in an area characterized by steeply sloping hillsides, with existing low-density, single-family housing on three sides. The quarry is considered a primary resource by the Office of Emergency Services. Material from the quarry would be vital to the recovery of the City of Oakland following a citywide disaster, such as a major damaging earthquake.

1.6.2 IMPACTS

The Leona Quarry Reclamation Plan presents a wide variety of possible land uses for the reclaimed quarry site, including low-, medium-, and high-density residential, light industry, and commercial. The Illustrative Future Land Use Map in the Land Use Element of Oakland's Comprehensive Plan shows the quarry site as suburban, low-density residential and open space. This is the City's development policy and clearly shows that commercial/industrial or high-density residential uses would be precluded from the site. Therefore, at this time, only low- and medium-density residential and recreational uses would be permitted, and City Planning Department staff feels that this situation is unlikely to change.

1.6.3 MITIGATION

None required.

1.7 TRANSPORTATION

1.7.1 SETTING

The project is located at the intersection of Edwards Avenue and I-580 in Oakland. I-580 is a primary regional traffic artery that leads from San Francisco and the Bay Bridge east through Oakland to communities beyond the East Bay Hills. Edwards Avenue, a narrow residential street, is an extension of 73rd Avenue and Hegenberger Road; the combination of which provides an important east-west connection between Highway 17, Bancroft

Avenue, MacArthur Boulevard and I-580. Both I-580 and the Edwards/73rd/Hegenberger connection are important elements of Oakland's traffic network in East Oakland.

The quarry is a seasonal business that peaks during the summer construction season. Quarry traffic is highest between May and September, and very low during the winter months. During a normal summer season, there are about 180 truck trips per day to and from the quarry. This number can double for the duration of very large jobs such as landfill operations.

1.7.2 IMPACTS

The reclamation plan for the project indicates that the rate of excavation, and therefore, truck traffic, is not expected to increase over the period of the quarry permit. Impacts from the quarry and future operations are not expected to change from existing conditions.

1.7.3 MITIGATION

None required.

1.8 AIR QUALITY

1.8.1 SETTING

Oakland's climate is generally mild, with maximum summer temperatures averaging in the 70s F occurring in July and minimum winter temperatures averaging in the 30s F. Winds, as measured at Oakland International Airport and the Alameda Naval Air Station are primarily from the west with a secondary frequency maximum from the southeast, perhaps reflecting drainage flow from the Hayward Gap. The most stagnant meteorological conditions occur during cold winter evenings and can lead to build-ups of carbon monoxide (CO); in the summer the sunny and hot weather throughout the Bay Area can lead to regional build-ups of ozone.

1.8.2 IMPACTS

Quarry operations produce emissions of particulate matter due to the disturbance of exposed earth surfaces caused by the action of equipment, blasting, and wind. There are

also emissions from motorized equipment and vehicles used in the quarry operations, as well as from haul trucks.

According to Michael Plumer, superintendent of the quarry, the proposed project would not result in an increase in working faces nor in the amount of vehicles or equipment used in operations. Since no increase in production is proposed, no changes in emissions from haul trucks would occur.

1.8.3 MITIGATION

None required. However, it should be noted that current mitigation measures for fugitive dust control, i.e., water spraying, would be continued.

1.9 NOISE

1.9.1 SETTING

The existing noise environment in the vicinity of the quarry is dominated by highway traffic generated sounds. The operation of quarry equipment generates noise but generally is contained by the shape of the quarry walls. Blasting occurs from twice per week to twice per month, and complaints have been received approximately once every five years regarding blasting noise.

1.9.2 IMPACTS

Because no new equipment, including haul trucks, is being added to the operation, noise levels are expected to remain about the same as they are now.

1.9.3 MITIGATION

None required.

1.10 PUBLIC SAFETY

1.10.1 SETTING

An expressed concern of City Planning Staff is the safety of adjacent residents and unauthorized visitors to the quarry site. During the lifetime of the quarry, work safety standards are established by the California Mine Safety Orders, which provide the

framework for employer and employee safety. It is also the responsibility of the quarry owner to make reasonable efforts to prevent unauthorized access to the site. At Leona Quarry, trespassing is discouraged by posted signs on the site perimeter, as well as chain link fencing topped by triple strand barbed wire along the lower levels of the property adjacent to public rights-of-way.

1.10.2 IMPACTS

The continued operation of the quarry would not generate any new risks for employees. The increase in residential development on adjacent properties may expose more persons to possible falls from working slopes because unauthorized entry can be expected to rise proportionally to the population increase in the area. Final graded slopes have been designed to ensure slope stability, but the steepness exceeds that normally permitted in Oakland Development projects.

1.10.3 MITIGATION

City Planning Staff recommends that the project sponsor explore possible design modifications to the final slope grades to reduce further the potential long-term personal hazards that could be posed by these slopes. In addition, it is recommended that the project sponsor establish a fence around the entire perimeter of the quarry to further discourage unauthorized access.

1.11 SOCIOECONOMICS

1.11.1 SETTING

Leona Quarry currently provides employment for approximately 30 persons. Secondary employment associated with the quarry totals approximately 165 persons, and includes approximately 50 haul truck drivers.

Current revenues to the quarry owners are approximately $190,000 per month, with monthly payroll totalling about $140,000. Total taxes paid to the City of Oakland are approximately $90,000 per year. Costs incurred by the City due to the operation of the quarry are primarily related to road maintenance and provision of fire and police services to the site.

The market for project resources, i.e., high grade rock products for construction activities, is expected to continue as in the past. Since a great percentage of the delivered cost of aggregate materials is related to transportation costs, the Leona Quarry has a distinct competitive advantage in the Oakland market over other East Bay quarries, which translates into a cost savings to buyers of rock products in Oakland.

1.11.2 IMPACTS

Employment levels are expected to remain the same at the Leona Quarry during the remaining 40 years of operations, and therefore, secondary employment will remain about the same as well. The current relationship of revenues and costs rebounding to the City of Oakland is also expected to remain the same. Finally, the market for quarry products is also projected to remain at about current levels.

1.11.3 MITIGATION

None required.

1.12 ALTERNATIVES

1.12.1 NO PROJECT ALTERNATIVE

The no project alternative would result in higher costs for rock products in Oakland due to higher transportation costs. Regional transportation impacts would also increase. Public safety impacts which could result form unauthorized access to the site would not be mitigated.

1.12.2 ALTERNATIVE CONFIGURATION OF SLOPES BELOW ELEVATION +730 MSL

Reconfiguring these slopes to a flatter configuration would decrease the amount of rock material available for sale, and could result in closing of the quarry sooner than 40 years. Given that the rock at these elevations is of very high quality, less concrete aggregate would be available from the quarry. In addition, the entire drainage system would have to be redesigned to accommodate the new slope configuration, and the existing geotechnical design would have to be reevaluated to ensure final slope stability. Finally, reduction of the steepness of the slopes would reduce the public safety hazard due to potential falls from the slopes.

2 INTRODUCTION

This report is a focused Environmental Impact Report (EIR) prepared in compliance with the California Environmental Quality Act of 1970 (CEQA) and the environmental guidelines of the City of Oakland. The report has been focused on those issues identified as potentially significant in the Initial Study prepared by the City of Oakland and attached as Appendix A.

The project sponsor, Gallagher & Burk, Inc., has requested approval of a Conditional Use Permit for continued operation of the existing Leona Quarry and approval of a Reclamation Plan. This EIR is intended to enable City decision-makers and local citizens to evaluate the effect of the project on the existing environment, examine and institute methods of mitigating adverse impacts and consider alternatives to the project.

3 PROJECT DESCRIPTION

3.1 LOCATION

The proposed project is located in the hills of Oakland, at 7100 Mountain Boulevard, east of Interstate 580 and Edwards Avenue (Figure 3-1). The 125-acre site is bounded by I-580 on the southwest, steeply sloping open space on the northwest with new residential development along the ridges, the extension of Campus Drive on the northeast and steeply sloping open space with scattered residential development at the lower elevations on the southeast (Figure 3-2).

3.2 DESCRIPTION OF THE PROJECT

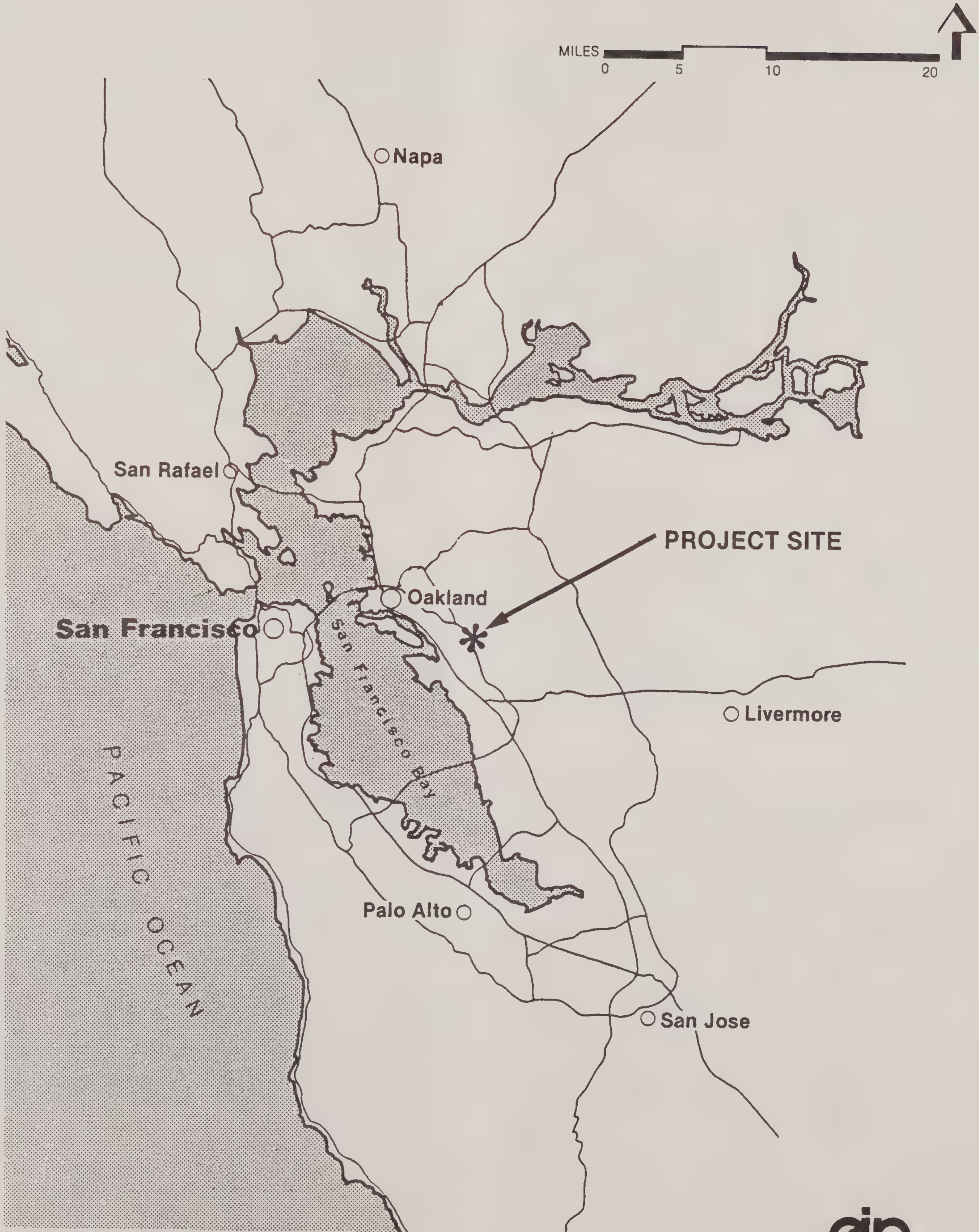
Gallagher & Burk, Inc., owner and operator of Leona Quarry is requesting approval of a Conditional Use Permit to continue operation of the quarry. In compliance with the State Mining and Reclamation Act of 1975, the applicant has submitted a Reclamation Plan for the potential use and configuration of the site after quarrying activities have been completed and the quarry closed (Figures 3-3 through 3-7, Reclamation Plan).

The current distribution of facilities and areas of operation are shown on the topographic survey used as the base map for the Reclamation Plan (Figure 3-3).

The proposed project represents a continuation of existing quarry activities, with no anticipated increase in the amount of material being extracted annually from the quarry. The principal means of loosening the rock is, and will continue to be by ripping and dozing, with some drilling and blasting. Blasting is by the sequential method which virtually eliminates noticeable vibration. Raw material is hauled from the working face of the quarry to the plant by off-highway vehicles. Material is screened, crushed, sorted and stockpiled on the site.

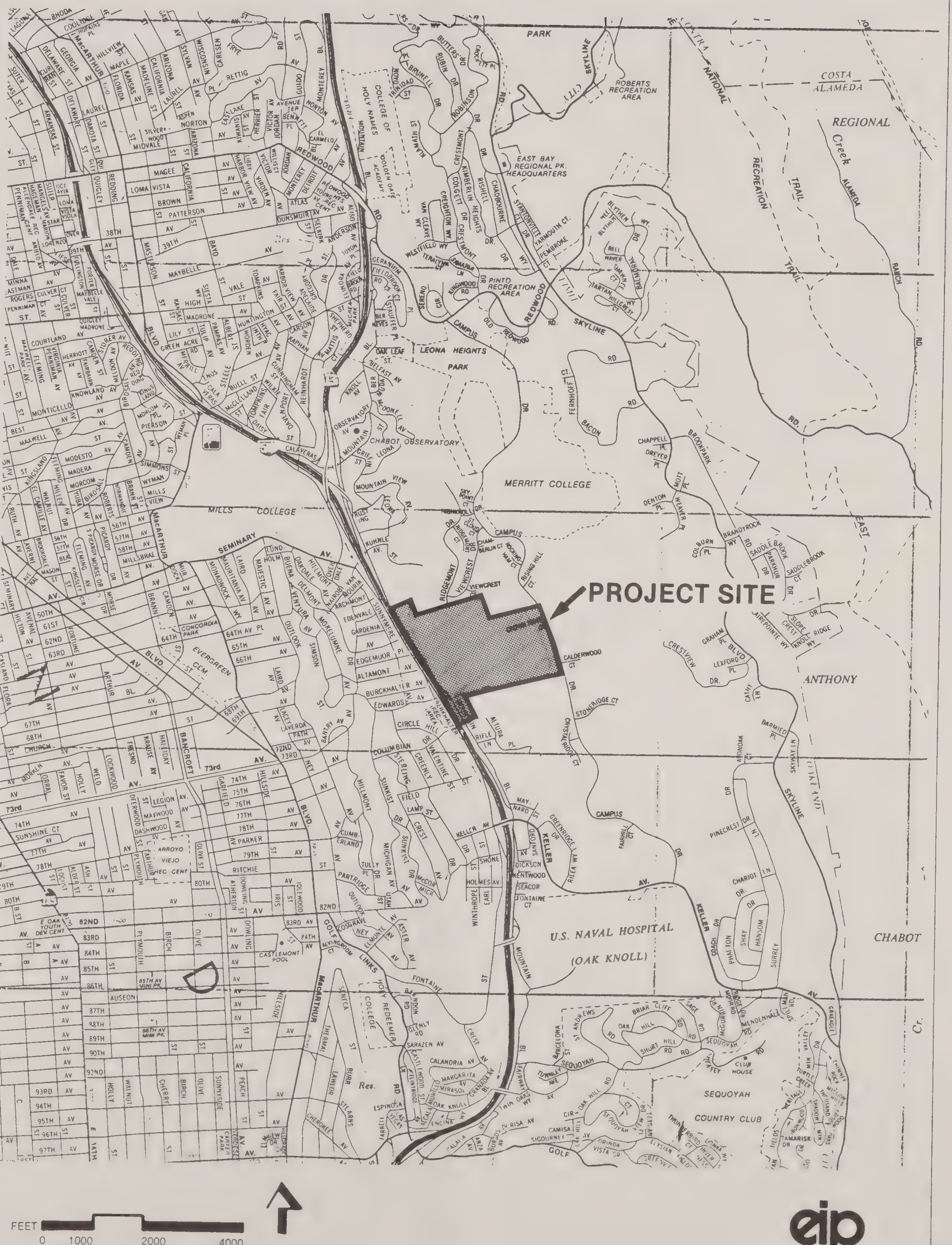
REGIONAL LOCATION MAP

FIGURE 3-1



SITE LOCATION MAP

FIGURE 3-2



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3.3 RECLAMATION SCHEDULE

Leona Quarry has been in continuous operation since approximately 1910. The life of the quarry will depend on market demand for the extracted material, which is not predictable beyond the immediate future. The final configuration proposed by the project sponsor would result in about 40 years of project life, until the year 2027.

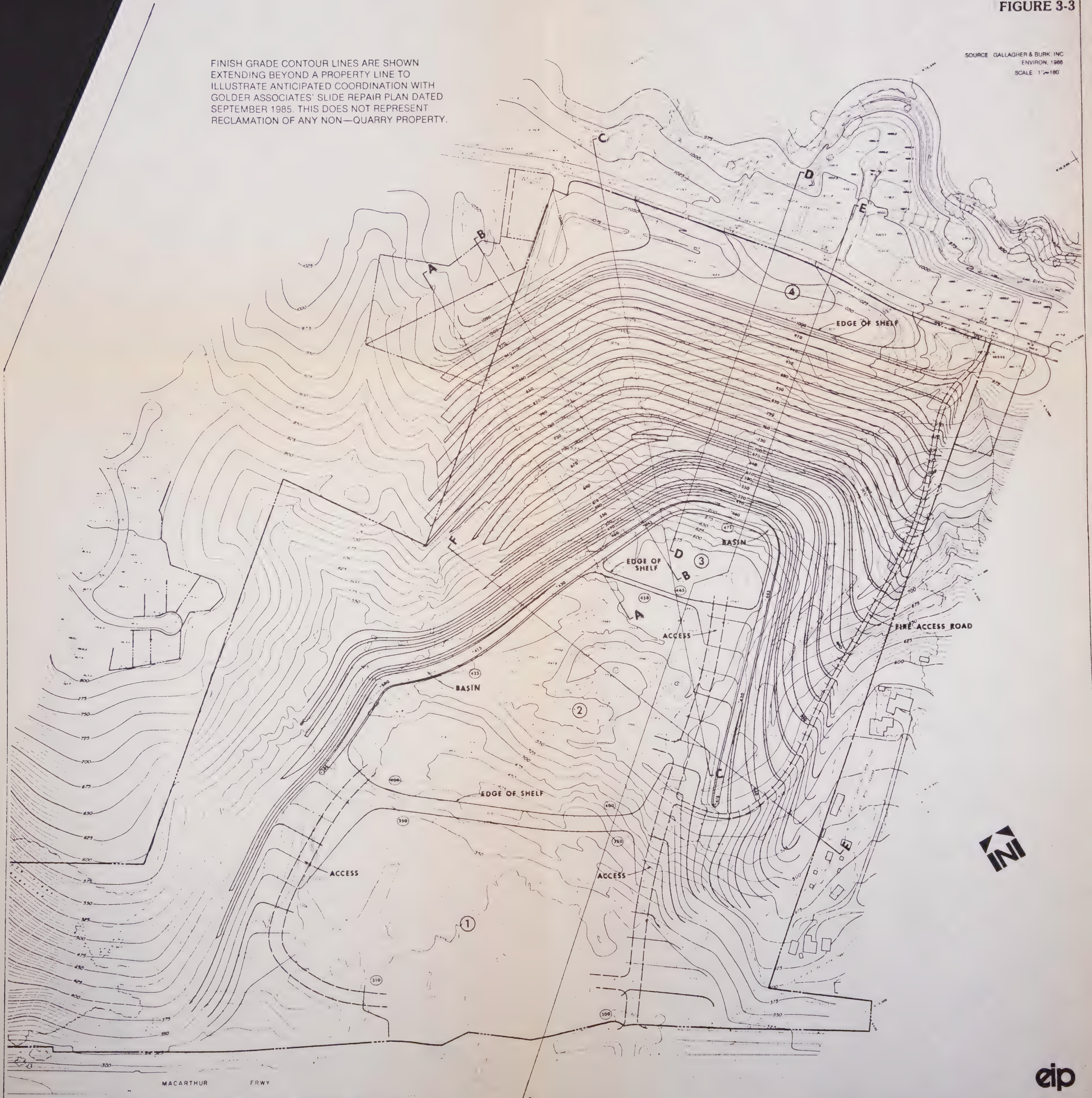
Reclamation will be concurrent with quarrying. Permanent water-handling systems will be installed as the final slopes and benches are completed. Each year, prior to the winter rains, revegetation treatment will be applied to those areas of final slope developed during the preceding year. Any necessary reworking or repair of previously installed vegetation will be done at the same time.

3.4 SUBSEQUENT LAND USE ON THE QUARRY SITE

The Surface Mining and Reclamation Act (SMARA) regulates the closure and reclamation of mines and quarries. The law requires that reclaimed land be left in a condition which would be "adaptable" to other uses after quarrying activities have ceased.

After completion of quarrying and reclamation activities, certain portions of the site will be suitable for urban development. This land is designated as Areas 1,2,3 and 4 on the Reclamation Plan (Figure 3-3). Potential roads for access to all parts of Areas 1,2 and 3 are indicated on the Plan. Area 4, located along the ridge, will have continuous frontage on Campus Drive.

The current General Plan would permit only residential or open space use on the site. The range of land use activities set forth in the proposed Reclamation Plan and listed below are general in nature, suggesting those uses which might be accommodated on the site. The project sponsor is not proposing any specific use for the reclaimed site inasmuch as the proposed closure would not occur for 40 years. Any uses other than those allowed by the General Plan in the year 2027 would be subject to the procedures required for a zone change and general plan amendment.

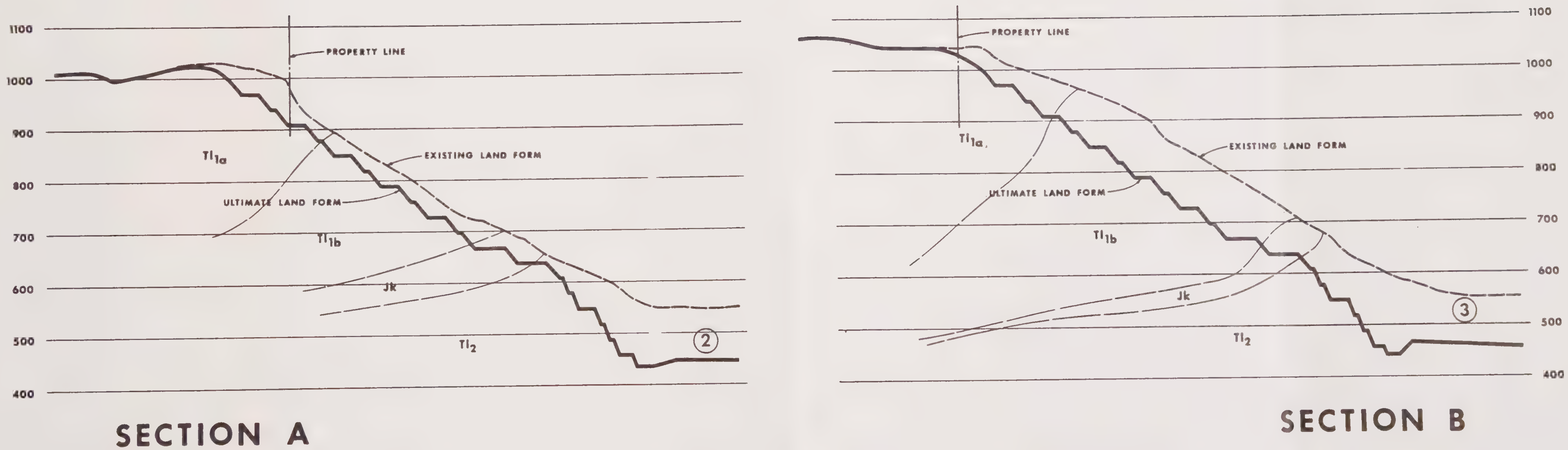


LEONA QUARRY RECLAMATION SITE PLAN

LEONA QUARRY RECLAIMATION PLAN CROSS SECTIONS

FIGURE 3-4

SOURCE: GALLAGHER & BURK, INC.
ENVIRON, 1986
SCALE: 1"~180'



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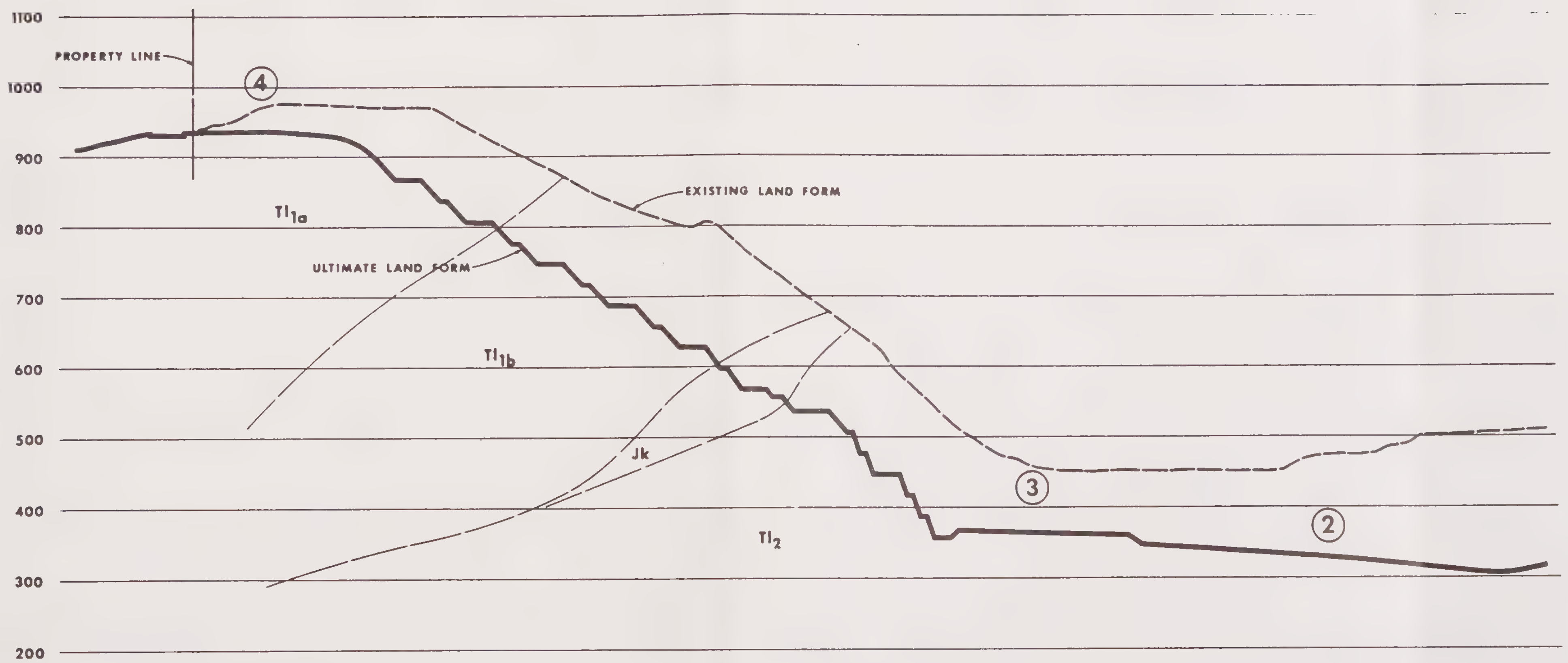
LEONA QUARRY RECLAMATION PLAN CROSS SECTIONS

FIGURE 3-5

SOURCE: GALLAGHER & BURK, INC
ENVIRON, 1986

SCALE: 1"~180'



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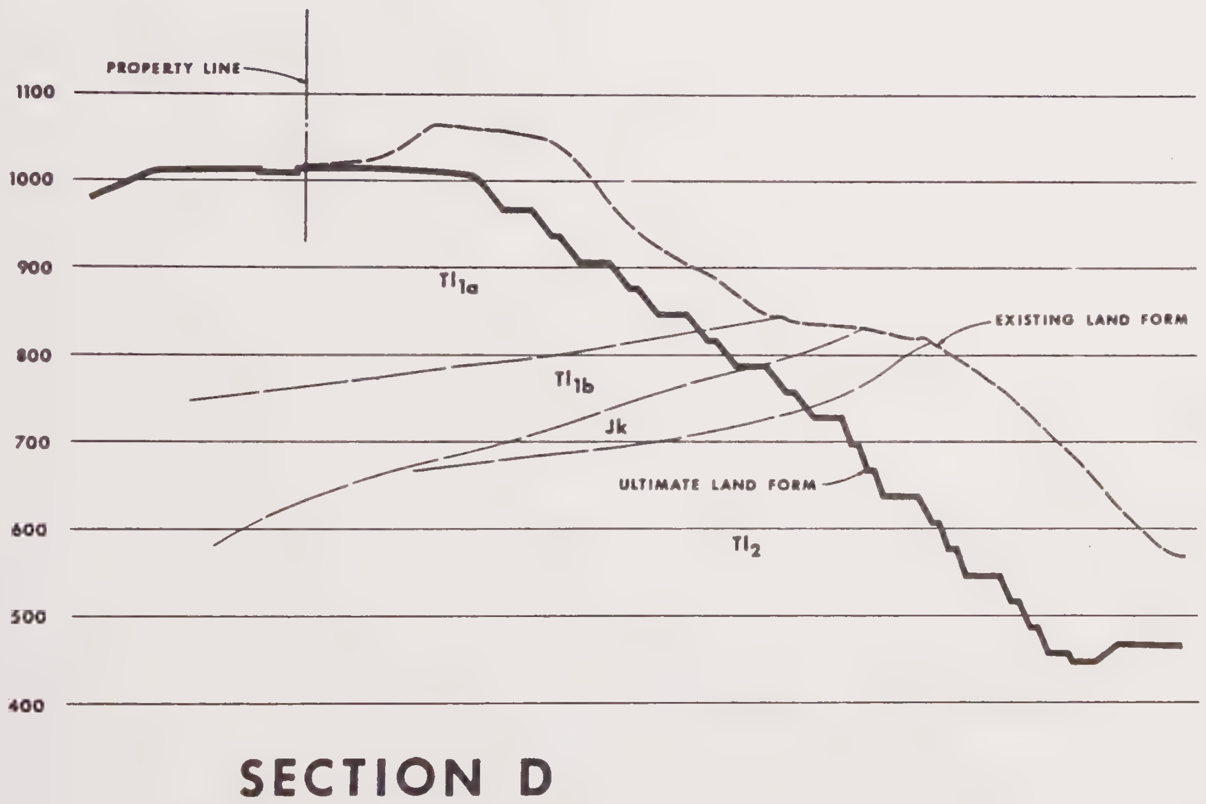
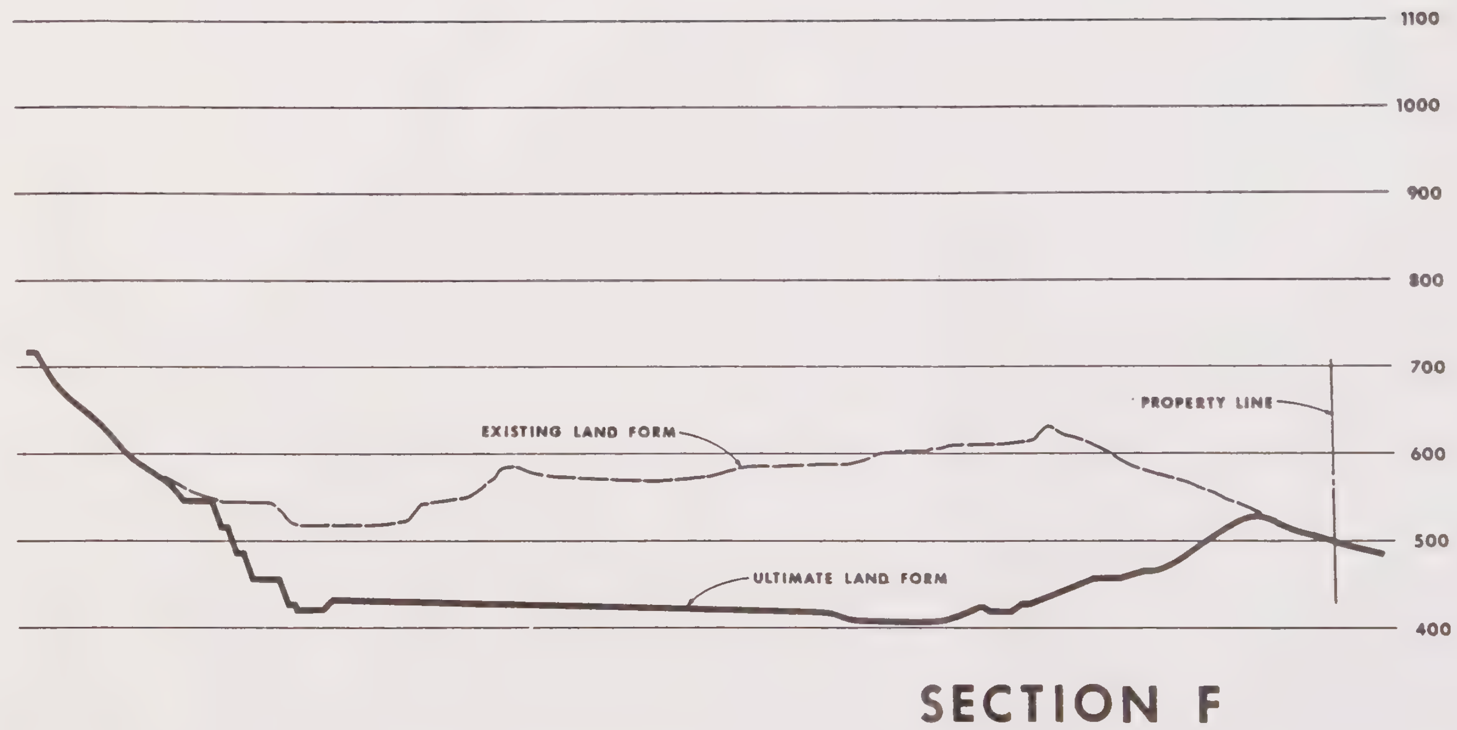
LEONA QUARRY RECLAMATION PLAN CROSS SECTIONS

FIGURE 3-6

SOURCE: GALLAGHER & BURK, INC
ENVIRON, 1986

SCALE: 1"~180'





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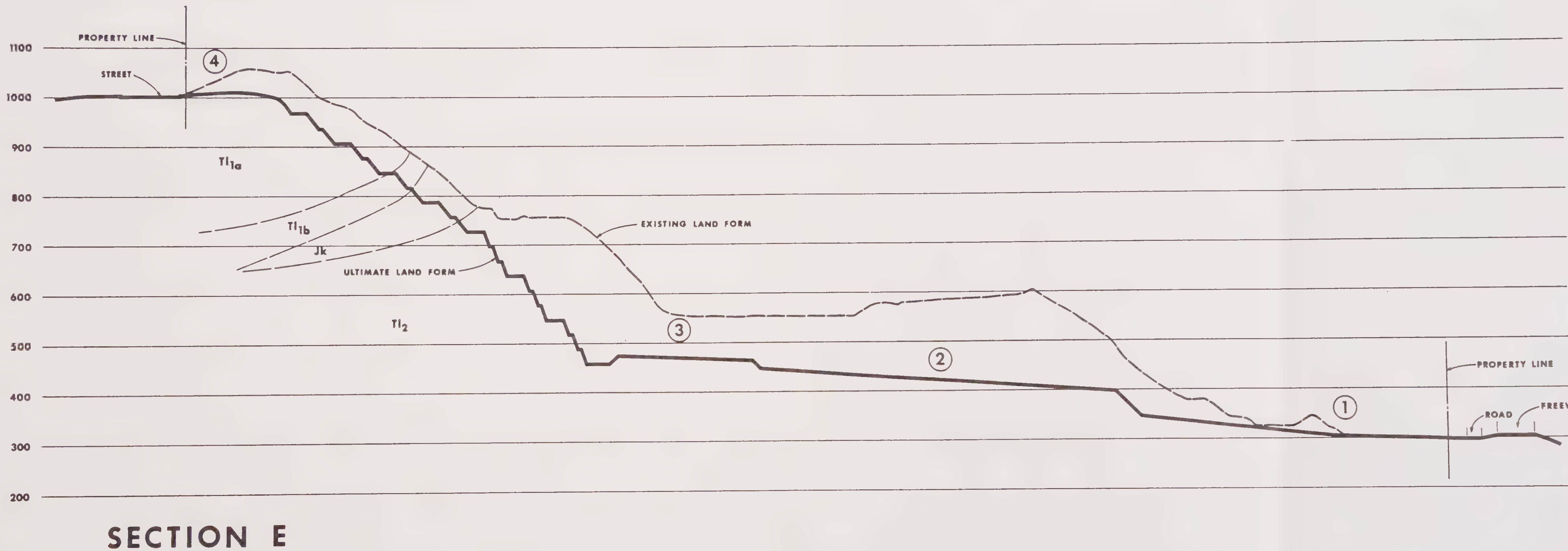
LEONA QUARRY RECLAMATION PLAN CROSS SECTIONS

FIGURE 3-7

SOURCE: GALLAGHER & BURK, INC.
ENVIRON, 1986

SCALE: 1"~180'



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- Area 1 - 20.8 Acres

  This site would slope upward from the access street by 50 feet. The project sponsor suggests that this area would be adaptable for single-family residential lots, medium or highrise multiple-family housing, commercial development, light industry, institutional use or recreation.

- Area 2 - 14.7 Acres

  The site would rise about 50 feet from its southwesterly edge, maximizing the potential for views. The potential land uses suggested by the project sponsor include single-family residential lots, medium or highrise multi-family housing, light industry, institutional use or recreation.

- Area 3 - 2.6 Acres

  This site would be a level shelf. The project sponsor has suggested that it is suitable for light industry, institutional use or a park.

- Area 4 - 6.6 Acres

  Situated on the ridge, this site has been suggested appropriate for single-family view lots, ranging in depth from 100 to 140 feet.

4 ENVIRONMENTAL SETTING, IMPACTS & MITIGATION MEASURES

4.1 GEOLOGY

4.1.1 SETTING

Regional Geology

The Leona Quarry occupies approximately 125 acres of a southwest-facing slope in the Oakland Hills. The northwest-trending Oakland Hills are part of the central Coast Ranges of California. The Coast Ranges include bedrock units of the Franciscan Assemblage of Jurassic and Cretaceous age.[1] The quarry area consists of a heterogeneous group of rocks that include the Jurassic and Cretaceous Franciscan Formation, the Cretaceous Leona Rhyolite, and the late Jurassic Knoxville Formation.[2]

Site Geology

The site is the southern part of an area, historically referred to as the Leona Heights. Another quarry in the area was operated for pyrite (iron sulfide) deposits within the Leona Rhyolite. However, the Leona Quarry project site contains rhyolite which is used for asphaltic concrete aggregate and road base material.[2] No pyrite is extracted at Leona Quarry.

This site was identified as a Regionally Significant Construction Aggregate Resource (Sector N on the Hayward Quadrangle) by the State Mining and Geology Board in 1985.[3] An area of "regional significance" is a sector, designated by the Board, which is known to contain a deposit of minerals, the extraction of which is judged to be of prime importance in meeting future needs of minerals in the particular region of the state within which the minerals are located and which, if prematurely developed for alternative incompatible land uses, could result in the permanent loss of minerals that are of more than local significance.

The bedrock geology in the project area has been mapped by the U.S. Geological Survey.[4] According to this source, the site is underlain primarily by Leona Rhyolite with occasional lenses of the Knoxville Formation. Quaternary units within the quarry include recent and ancient landslide deposits, as well as colluvium at the bases of slopes.

Site-specific mapping has been conducted on the site and is explained in Leona Quarry Geotechnical Reclamation Design.[5] That document divides the bedrock of the quarry into three units based on lithology, stratigraphy and structural position: a lower unit of the Leona Rhyolite, a zone of the Knoxville Formation, and an upper unit of the Leona Rhyolite. The lower unit covers most of the quarry floor, the lower slopes on the southwest side of the site, and the middle to upper level slopes in the northeast section. A remnant shale member of the Knoxville Formation separates the two rhyolite units and also is exposed as small localized lenses. The upper rhyolite is divided into two subunits based on lithology, degree of weathering, and structural characteristics.

The exposed rocks on the site indicate fracturing and jointing. Unhealed fracture and joint surfaces are generally surfaces of weakness along which slopes commonly fail. Extensive work has been completed by the project sponsor to evaluate the presence and orientation of joints and fractures on the site.[6] On the basis of numerous data points for both of the rhyolite units, the shale and the shear zones there appear to be no strongly preferred fracture orientations. Orientations vary from slope face to slope face.

Bedding planes and shear zones in the rocks also are potential sources of failure. The angle between the bedding planes and the final slope faces are important. If a slope were cut at an angle steeper than the dip of the bedding planes or sheer surfaces, slope failure would be more likely to occur. Contacts observed in the rhyolite generally strikes west-northwest, with an average dip of 43 degrees to the northeast, decreasing with depth. The beds dip into the quarry face, thereby precluding slope failure along the bedding planes. A number of shear zones, varying in width from 10 to 25 feet have been identified on the site. The shear zones appear to have vertical to near-vertical dips and are almost universally oriented obliquely to the slopes, thereby eliminating them as contributors to slope failure.[7]

Seismicity

The site is located within a seismically active region, dominated by northwest-trending faulting on a number of active or potentially active fault zones. Fault zones located within 20 miles of the quarry that may be potential sources of future large magnitude earthquakes are the San Andreas, the Hayward, the Calaveras, and the Greenville Faults. Future large earthquakes on these fault zones are estimated to have maximum magnitudes (M) of 8.3, 7.0, 7.0, and 6.5, respectively.[8,9] Recurrence intervals for these maximum magnitude earthquakes vary from fault zone to fault zone. It is estimated that M8.3 earthquakes occur along the San Andreas Fault Zone every 100 to 1,000 years; M7.0 earthquakes along the Hayward Fault Zone every 276 to 553 years; M7.0 earthquakes along the Calaveras Fault Zone more than 160 $\pm$60 years apart; and M6.5 earthquakes along the Greenville Fault Zone every 1,200 to 4,200 years.[10] Studies of the history of displacements created by large earthquakes (M6+) on the south-central San Andreas Fault reveals a sequence of 12 major events during the past 2,000 years at various intervals ranging between 100 to 200 years, averaging one large event about every 140 years. The chronology of large earthquakes on the northern San Andreas Fault and other faults in the Bay Area is less certain.

Based on current understanding it is appropriate to consider that another great earthquake (M8+) can occur on the northern San Andreas Fault sometime during the next several decades.[11] The timing of the next major earthquake (M7+) on the Hayward Fault is uncertain; however, the last major earthquake occurred 150 years ago, indicating that a recurrence in the near future is not likely. The proximity of the Hayward Fault to Leona Quarry, and consequently the minimal attenuation of vibrations, overshadows the larger expected magnitudes generated along the more distant San Andreas Fault when developing a scenario for seismic response.[12] The quarry would experience "violent" to "very violent" ground shaking during an M7.0 earthquake epicentered nearby on the Hayward Fault.[13]

There are no known active or potentially active faults on the project site. An active fault is one that has shown evidence of faulting within the past 11,000 years, and a potentially active fault is one that has shown evidence of movement within the past 2 million years. Areas surrounding the topographic extent of active or potentially active faults have been established as Special Studies Zones by the Alquist-Priolo Act. The site is located approximately 1,000 feet east of the Special Studies Zone of the Hayward Fault.

Topography and Slope Stability

The topography of the site consists primarily of man-made temporary working slopes up to 50 degrees. Natural slopes occur on the fringes of the property to the north, south and east, with overall slopes up to 35 degrees.[14] According to the U.S. Geological Survey topographic map, slope segments vary from 10 degrees to 44 degrees. Elevations range from 300 to 1,070 feet above mean sea level with a vertical relief of approximately 770 feet. The topography of the active quarry area continues to change as rock is removed.

Both recent and ancient landslides occur as shallow debris flows and rock slides within and on the fringes of the quarry. Landslides are located on the north, west, northwest and the steep east face of the quarry. The landslides in the quarry resulted from a combination of factors including high pore-water pressure, adversely oriented geologic structure and strong weathering. The high pore water pressure appears to have exerted the greatest influence on slope instability in the 1970 and 1983 landslides.[15]

4.1.2 IMPACTS

The major geologic hazard associated with continued mining at the project site is the potential instability of the quarry faces. The two possible sources of slope instability are (1) response to seismically-induced groundshaking and (2) over-steepening of quarry faces. In either case, the instability would be aggravated by the presence of water trapped within the quarry walls. Undrained water would cause increases in pore water pressure which, in turn, would reduce the integrity of the rock; i.e., its ability to resist such external forces as groundshaking or gravity. The project sponsor has conducted extensive analyses to evaluate the slope stability of the site during and following quarrying activities.[16] The slope stability analyses took into account various seismic events occurring along the nearby active and potentially active faults, the nature of the rock materials, and their material strength. As a result of the analyses stable slopes were designed for the final quarry configuration. These are shown in Figure 3-3, with cross-sections shown in Figures 3-4 through 3-7.

If major slope failures were to occur during or after quarrying operations, adjacent residential properties could be affected. Historically, landsliding has occurred near the crest of the quarry. The 1970 slide that occurred in the northwest part of the quarry

involved erosion, oversteepening, adverse fracture patterns and concentrated drainage. The 1983 slide occurred in the northeast portion. Both slides appear to have been the result of the three contributory factors previously mentioned: increased pore water pressure, adverse structural orientation, and strong weathering. Although none of these factors is under the control of the quarry operators, slides probably would not have occurred in these particular locations if the rock had not been exposed during quarrying. It is possible that sliding could have occurred even if the slopes had been left in their natural conditions.

In the future, similar landsliding could recur if measures were not taken to prevent it. Slope failures or other mishaps associated with the quarry operation could adversely affect adjacent properties. Landslides could increase sediment loads in the on-site stormwater collection systems, if slide debris disrupted the ponds and benches or was not cleared from drainage ways prior to the onset of winter rains. To develop measures to mitigate these potential impacts, the quarry operators retained Golder Associates to perform a series of slope design and landslide reclamation studies.[17] Additionally, reclamation, revegetation and hydrologic studies were commissioned from Environ, Wesco and Bissel & Karn, Inc., respectively.[18] The reclamation and remedial landslide recommendations that evolved into the reclamation design are summarized in Section 4.1.3, Mitigation.

The reclamation plan and associated revegetation and hydrology/drainage plans were prepared to fulfill the requirements the Surface Mining and Reclamation Act of 1975 and City of Oakland Ordinance No. 9826 regarding surface mining operations. The reclamation plan indicates a schedule of performance for the life of the proposed project.

4.1.3 MITIGATION

Geotechnical recommendations, presented by Golder Associates, for the correction of slope instability and for the repair/prevention of landslides appear in their 1984 and 1985 reports[19] and are incorporated in their 1986 Leona Quarry Geotechnical Reclamation Design. The geotechnical reports prepared by Golder Associates are incorporated herein by reference. Briefly, the conclusions reached regarding slope stability are as follows.

- Rock strength in the quarry increases with depth as the effects of weathering decrease.

- Failure of surficial soils and weathered rhyolite is exacerbated by slope saturation.
- Failure of fresh (unweathered) rhyolite occurs along structural discontinuities (weak zones such as joints or faults).
- Adequate drainage is critical to long term stability.
- 2:1 slopes in soil, 1:1 slopes in weathered rhyolite and 0.5:1 slopes in fresh rhyolite would be stable under static conditions if adequate drainage were maintained.
- "Adequate drainage" must include grading and drilled drain holes sufficient to rapidly dewater the final slopes to a depth of 25 feet back of the slope faces.
- Earthquake-induced rock accelerations up to 0.5 g would not jeopardize the overall stability of the final slope design.[20]
- Blast damage should be minimized as the final slope is approached to reduce the degree of disturbance of the rock mass.
- Quarrying operations should be conducted according to a predetermined plan which would involve the systematic extraction of material from the top levels down, thus precluding oversteepening at the toe of the slopes.[21]
- Sufficient survey control should be established and referenced to prevent excavation outside the design limits.[22]

Repair measures for the landslide areas were developed because property development adjacent to the quarry would increase the amount of irrigation (lawn watering) and pool leakage water entering the slopes that could reduce soil slope stability.

- The 1983 slide will be stabilized by the installation of subdrains in the slide toe to reduce pore water pressure.
- The headwall and flanks of the slide would be benched and subdrained.
- An 80-foot wide setback from the 1,040 foot elevation crest would be maintained for the protection of structures. This would include a 50-foot setback for lotlines and an additional 30-foot setback for any substantial building or house.
- The 1970 slide will be stabilized by the use of a welded wire retaining wall containing crushed rock fill.
- Subsurface drainage and surface runoff control would be provided.
- The existing scarps would be lowered by limited grading.

The project sponsor also has proposed installation of slope monitoring instruments along the crest of the quarry at 200-foot centers to be monitored every 2 months during quarry operation. A phased revegetation plan to assist in slope stabilization and erosion control is proposed as a provision to reduce or eliminate erosion/sedimentation as final slopes are achieved. Erosion/sedimentation control would be in place following cessation of quarrying activities.

A review of the extensive analysis and documentation provided by the project sponsor indicates that the conclusions and proposed recommendations are based on conservative geologic models and employ proven engineering methods. The slope designs are neither experimental nor innovative. The slide repair/protection techniques also are well-understood, standard procedures. From a geotechnical view, the proposals represent the result of sound geotechnical practices. From an administrative view, three activities could be considered by the City.

- The slopes created during quarrying operations should not exceed those recommended by the sponsor's geotechnical consultant. Recommendations obtained for specific rock units within the quarry should be adhered to. Inspection reports by an engineering geologist registered in the State of California should be submitted to the City of Oakland on a regular basis.

- During mining activities near the crest of the quarry, adjacent to residential areas, monitoring of slope instrumentation probably should be more frequent during the rainy months. A schedule to identify potential slope failure at as early a stage as possible, to be established and maintained by a registered engineer, should contain sufficient flexibility to accommodate seasonal variations in moisture content.

- The project sponsor should work with the City to establish some reliable means to ensure maintenance of slope stability following cessation of quarrying activities. Because the eventual property owners would ultimately be responsible for the stability of their land, the maintenance of any systems installed or established on the site should be codified in order that the property owners and the City are mutually aware of their various inspection and upkeep obligations.

Erosion control is essential to avoid adverse environmental impacts from the proposed project during and after quarrying activities through the completion of reclamation program. In order to ensure that the proposed revegetation program is effective in minimizing erosion as well as being appropriate for the site, the following measures are recommended:

- o Develop performance standards for revegetation prior to reclamation efforts; parameters should include vegetation survival, percent plant cover, and minimum plant productivity. Once performance standards have been developed, the effectiveness of the reclamation scheme can be measured against the performance standards.

City of Oakland Ordinance No. 9826 amends the Planning Code to include surface mining operations in the definition of mining and quarrying extractive activity, to make them conditionally permitted uses and to add special regulations for those activities. Section 7025 of the ordinance, addressing reclamation plans, states that such a plan is required prior to issuance of a permit and that a surety bond or other security may be required to guarantee performance of the plan, as determined by the Director of Public Works.

- o If the Director of Public Works determines that a surety bond is needed, it should be related to each annual reclamation phase rather than to the entire proposal. The cost of each year's reclamation of completed slopes should be estimated annually by the project sponsor in cooperative action with the City. Upon successful completion of the year's scheduled reclamation, the bond would be released by the City. Success of a specific year's reclamation should be measured against obtainment of the performance standards previously established.

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[1] J.E. Case, Upper Cretaceous and Lower Tertiary Rocks, Berkeley and San Leandro Hills, California, U.S. Geological Survey Bulletin 1251 J, 1968.

[2] Melvin Stinson, et.al., Mineral Land Classification, Aggregated Materials in the San Francisco-Monterey Area; California Division of Mines and Geology Special Report 146, 1983. The Cretaceous age determination for the Leona Rhyolite is currently in dispute.

[3] Sector N, Hayward Quadrangle as noted in Title 24, Division 2, Chapter 8, Subchapter 1, Article 2, Section 3550.10 of the California Administrative Code, revised October 2, 1986.

[4] D.H. Radbruch, Aerial and Engineering Geology of the Oakland East Quadrangle, U.S. Geological Survey, 1969.

[5] Golder Associates, Leona Quarry Geotechnical Reclamation Design, Volumes I, II, and III, Job No. 853-1021F. Prepared for Gallagher & Burk, Inc., May, 198nd Activity of the Greenville Structural Trend: in Proceedings, Conference on Earthquake Hazards in Eastern San Francisco Bay Area, California, California Division of Mines and Geology Special Publication 62, 1982, pp. 187-196.

[10] Golder Associates, May, 1986, Volume I, Table 6.

[11]James F. Davis, et al., Earthquake Planning Scenario for a Magnitude 8.3 Earthquake on the San Andreas Fault in the San Francisco Bay Area, California Division of Mines and Geology Special Publication 61, 1982, page 4.

[12]Paul J. Visca, Associate, Golder Associates, letter to McInerny & Dillion, November 3, 1986.

[13]R.D. Borchert, et al., Prediction of Maximum Earthquake Intensity in the San Francisco Bay Region, California, for Large Earthquakes on the San Andreas and Hayward Faults, U.S. Geological Survey, Map MF-709, 1972, scale 1:125 000.

[14]Golder Associates, May, 1986, Volume I, page 17.

[15]Golder Associates, Leona Quarry, Landslide Repair Proposed, Remedial Measures. Report prepared for Gallagher & Burk, Inc., 1985, pages 18 to 20.

[16]Golder Associates, Leona Quarry, Geotechnical Assessment of Quarry Slope Stability, December, 1984; Leona Quarry, Landslide Repair, Proposed Remedial Measures, 1985; Leona Quarry Geotechnical Reclamation Design, May, 1986.

[17]Ibid.

[18]Environ, Reclamation Plan for the Leona Quarry of Gallagher & Burk, Inc., Oakland, California, June, 1986; Wesco, Revegetation Plan for Leona Quarry (Gallagher & Burk, Inc.) Oakland, California, Prepared for McInerney & Dillon, November, 1984; Bissel and Karn, Inc., Civil Engineers, Hydrology and Drainage Report, Leona Quarry of Gallagher & Burk, Inc., Oakland, California, Prepared for McInerney & Dillon, November 1984.

[19]Golder Associates, December, 1984, Section 4, "Stability of Final Slopes" and Section 5, "Conclusions," pages 21 through 29; Golder Associates, September, 1985, Section 5, "Proposed Remedial Measures," pages 21 through 27.

[20]Subsequent stability analyses conducted during Golder Associates geotechnical reclamation design indicate that the majority of slopes would have safety factors in excess of 1.0 at maximum accelerations of up to 1.0g and safety factors in excess of 1.1 for maximum acelerations up to 0.68g. P.J. Visca, November 3, 1986.

[21]P.J. Visca, November 3, 1986, Op. Cit.

[22]P.J. Visca, November 3, 1986, Op. Cit.

4.2 HYDROLOGY & WATER QUALITY

4.2.1. SETTING

Existing Surface Drainage Conditions[1]

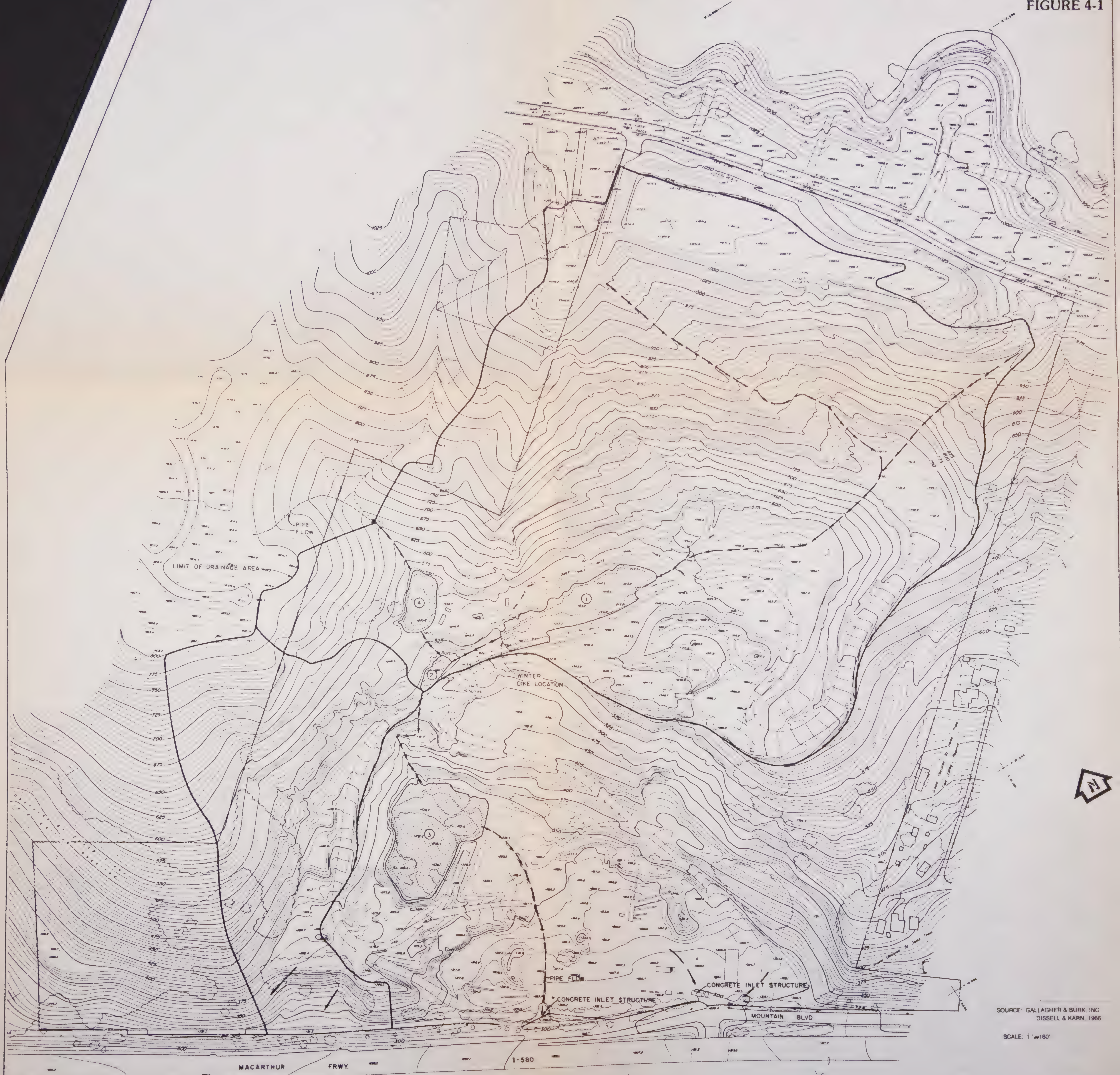
The topography of Leona Quarry and the location of the storm drainage ponds is shown in Figure 4-1. The quarry has been worked in several benches and shelves on each of the three faces.

The property drains from the north, east and south into the quarry. It then drains west overland to existing storm water pickup points along Mountain Boulevard where it enters the City storm drain system. The City system connects to the Alameda County Flood Control system at Sunnyside Road.[2] The site receives about 25 inches of rain per year.

Most of the water that runs down the upper quarry face is directed to the working shelf. The working shelf is approximately 75 feet wide and is graded to drain away from the quarry face. The shelf is pitched toward its center where a minimum 2% cross slope carries water from the working face to the outer edge of the shelf. A 3-foot berm is maintained at the outer edge of the shelf for equipment safety. The berm also serves to direct stormwater to the center of the shelf where it runs down the lower face to the plant area. At the plant level it is directed by drainage swales to existing stormwater ponds.

There are four stormwater ponds below the plant area, as shown in Figure 4-1, which detain stormwater and retain silt. Collected water is transferred from pond-to-pond by a pipe system set through the pond dikes. Maintenance and cleaning of the ponds is performed on an "as-needed" basis.

Pond 1 is a cut-and-fill, diked pond at the north end of the quarry floor. It is the initial collection pond for drainage from the working face and from the area of the working shelf. This pond was enlarged in the Fall of 1984 when the bottom was cut down to the level of the bedrock. At that time, a dike was constructed at the lower end of the pond to enhance silt collection. A discharge pipe held above the level of silt collected on the bottom of the pond passes through the dike and empties into a drainage swale that carries the discharge overland to Pond 2.



SOURCE: GALLAGHER & BURK, INC
DISSELL & KARN, 1986

SCALE: 1"≈180'

eip

LEONA QUARRY RECLAMATION EXISTING DRAINAGE CONDITIONS

Pond 4 collects stormwater discharged from the subdivision area to the north as well as minor amounts of local runoff. It discharges by pipe and drainage swale to Pond 2. Pond 2 is an excavated area that collects stormwater from Ponds 1 and 4, as well as minor amounts of local runoff. Water is discharged from this pond by a pipe and a drainage swale leading to Pond 3. Pond 3 is a large diked pond that is the final collector for the majority of the stormwater runoff from the site.

Drainage calculations based on the 10-year storm (3.74 inches in 24 hours) with a runoff factor of 90% indicate a storage requirement of 67 cubic yards per acre of drainage area.[3] The system currently meets this requirement.[4]

Proposed Changes in Storm Drainage System

The regulatory requirements for reclamation include provisions for erosion and sediment control during mining activities and after mining activities have ceased. The following modifications are proposed as part of the reclamation plan for the quarry to meet this requirement.

As an interim drainage measure, wherever there are areas of unfinished working face, the present method of collecting and disposing of surface water would continue. Stormwater would continue to be collected on the working shelf and allowed to flow down the face to the level of the plant where it would be channeled into the existing pond system.

As final slopes and benches are completed, the final drainage system, including ditches, structures and pipes, would be installed progressively. Water from the final drainage improvements would continue to be discharged onto the working shelf to be disposed of as it is at the present time.

No interim improvements are anticipated for Ponds 1, 2 and 4. However, Pond 3 has been modified by the installation of an overflow pipe and a buried discharge pipe across the yard which connects to the storm drain system at Mountain Boulevard. Pond 3 acts as the principal retention pond and silt collector for peak storm flows. The pond has sufficient storage capacity to allow discharge at a predetermined rate which is equal to or lower than the rate at which stormwater enters the pond. Because of this retention capability, the amount of water leaving Pond 3 can be adjusted.[5]

In the final drainage design, final slopes would be benched at various intervals as described in the reclamation plan and illustrated in Figure 4-2. The benches would be formed with a 4% slope along the face and a 2% slope in towards the face. A lined ditch would be installed at the rear of the bench to carry runoff water to the pickup points. Each pickup point would consist of an inlet box with side openings, connected to the corresponding box above and below by corrugated metal pipe. The outflow pipe from each box would be buried as it crossed the bench to the quarry face where it would extend down the face of the slope to the next bench level. Inlet boxes would be designed to act as a combined collection point and energy dissipator.

As each final bench was created, there would be ample area on the work shelf to provide access for installing the inlet box and connecting pipes. The corrugated metal pipe would be anchored to the surface by driven or drilled rods and pipe clamps at each pipe joint.

A basin (Figure 4-2) would be installed as part of the final reclamation phase. The present pond system would continue in use until the final stage of quarrying when the basin would be formed at the toe of the quarry face. This basin would serve as a buffer, and it would vary in width according to the height of the adjacent slope. The basin would receive all the surface runoff collected in the upper drainage system and carried down the finished quarry face. Energy dissipators (boulders) would be installed where the various pipes discharged into the basin.

The basin would be graded so that both of its legs drain gently toward outlets connected to buried pipes which would carry the water to the City/County storm system. Sills and/or rock barriers would be installed in the basin, as needed, to inhibit the flow. Thus, sediment would drop out at designated locations where it could be reached for removal. It is anticipated that there will be very little silt to be removed from the stormwater after quarry operations have ceased. The basin also would provide ample volume to serve as a stormwater retention pond.

Depressurization systems also would be installed. It will be important to reduce the potential build-up of water pressure within the rock formation to maintain slope stability. As final slopes were completed, drains would be installed in the rock as recommended by the geotechnical consultant. Water discharged from the depressurization system would

FIGURE 4-2

LEONA QUARRY RECLAMATION ULTIMATE DRAINAGE SYSTEM

flow into the storm drainage system. A discharger's permit from the California Regional Water Quality Control Board (CRWQCB) may be required.

Groundwater Conditions[6]

The quarry has a relatively deep unconfined water surface that occurs from a depth of about 70 feet to 315 feet along the north and east faces. Water levels from the groundwater monitoring data indicate that the water table surface reflects the ground topography. Water levels decrease to the south-southwest, at a gradient of about 0.3 to 1 (4 inches vertical per 1 foot horizontal). Data also suggest that existing recharge to the groundwater table appears to be concentrated in the northeast portion of the quarry. The groundwater surface is highest in that area.

The magnitude of water level fluctuation varies widely. The timing of the water level fluctuations appear to be related to the occurrence of periods of rainfall. By comparing the precipitation data and the water level data it can be seen that the groundwater has risen and fallen in response to prominent periods of rainfall.

The noticeable groundwater fluctuations have lagged about 5 to 10 days behind the peaks in rainfall. Most of the piezometers indicate an overall increase in the groundwater elevation, likely reflecting the overall effects of winter rainfall. In general, there appears to be no correlation between the magnitude of water level fluctuation and the geologic unit being monitored. It appears that the variations are more likely related to the local nature and degree of fracturing and weathering than to the geologic unit. The larger fluctuations occur in geologic sections having closely spaced open fractures or shear zones and that are moderately to strongly weathered.

Perched water tables are present within the quarry and appear to be primarily associated with the upper contact of the altered Knoxville Formation zone that occurs along the north and east faces. Surface springs associated with this contact have been noted in previous studies by Golder Associates (1984, 1985), and by ESC (1983). A piezometer installed at the shale/rhyolite contact in the northeast part of the quarry shows a perched water level 2-4 feet above the contact. This perched water table is about 35 feet above the unconfined surface. Thermal alteration and the presence of shale and clay probably create a low permeability zone that retards downward groundwater flow.

Permeability tests coupled with the groundwater fluctuation data suggest that the geologic units at the quarry have moderate to very low bulk coefficients of permeability in the range of 10^{-4} to 10^{-10} cm/sec. The measured water level fluctuations are of moderate magnitude and suggest that bulk permeability of the quarry rock may be in the order of 10^{-5} to 10^{-6} cm/sec. As in most fractured rock units, the bulk permeability is a composite of the conductivities within fractures and through intact rock. Consequently, it is not unreasonable to expect local permeabilities to exceed those measured about one order of magnitude dependent upon the intensity of fracturing.

Water Quality

The ambient quality of surface water in the project area can be recognized by examining the urban stormwater runoff entering the drainage system along Mountain Boulevard. Biological, chemical and particulate loads (contaminants) are introduced into urban runoff from two sources: (1) catch basins and (2) the land surface itself.

Catch basins within a drainage system can be a source of "first-flush" or "shock" pollution. This occurs when liquids and solids retained in catch basins are flushed out during the early stages of a rainstorm. The liquid remaining in a basin after a runoff event (rainstorm) tends to become septic. The solids (sediment and debris) trapped in the basin take on the general characteristics of septic sludge. During the next storm the liquid in the basin is partially displaced by fresh runoff water. Even during minor rainfall this displacement factor can release the major amount of the liquid and some of the solids retained in the basin.[7]

The most important contributor of contaminants to urban runoff is the land surface itself, primarily the streets and gutters and other impervious areas directly connected to streets or storm sewers. Materials accumulate on these surfaces in a variety of ways. There are, for example, debris dropped or scattered by individuals; sidewalk sweepings; debris and other particulate matter washed into streets from yards and other indigenous open areas; wastes and dirt from building and demolition; fecal droppings from dogs, birds, and other animals; remnants of household or industrial refuse dropped during collection or scattered by animals or wind; dirt, oil, tire, and exhaust residue contributed by automobiles; and fallout of air-borne particles.

Contaminants build up on urban surfaces between rainstorms. Solids in the water contaminant load build up most rapidly during the first 48 to 72 hours after a major rainfall. In an industrial area, this build-up amounts to about 800 pounds of solids per mile of curb by the end of the third day. Accumulation rates decrease with time, reaching about 1,300 lb/curb mile after two weeks. The comparable levels for commercial/office and residential areas are about 500 lb/curb mile after 72 hours, rising to 600 and 750 lb/curb mile respectively after two weeks.[8]

The quarry primarily contributes sediment to the water contaminant load from the normal operations of mining, loading and hauling equipment. No toxic or septic material is known to leave the site. As described above, four ponds are used as settling and stilling basins in which most of the sediment is trapped prior to discharging runoff from the site.

Oil changes and refueling of equipment or tanks is done in a sealed catchment area from which residue is collected periodically and trucked off the site to be recycled. This catchment has no outlet to the storm drainage system. Water from steam cleaning of equipment also is collected in a separate sealed catchment that drains internally to a concrete tank. The catchment tank has no outlet to the storm drainage system and, therefore, does not contribute to "first-flush" effects. The tank is pumped periodically and the water is reused for dust control within the quarry. Fuel tanks also are stored in catchment areas to prevent accidental spills from entering the storm drainage system. No concrete or asphalt batching plant is operated on the site.

4.2.2 IMPACTS

Storm drainage, erosion/siltation and water quality control impacts are closely related. Because the only major constituent of the water contaminant load generated on the quarry site is the sediment produced by the mining operation itself, a siltation control system that did not trap sediment on-site would be a contributor to stormwater turbidity. Other contaminants that normally occur in the urban and suburban environment would not originate at the quarry while the on-site systems remained operative. If water leaving the site were to carry sediment into the City/County storm drain system, downstream siltation could eventually build up in the system causing local flooding (due to backups) and increased maintenance costs to clean and repair the facilities.[9] Because water-borne particulate matter (sand, silt, clay) unavoidably is produced by any quarrying operation, it

is necessary to recognize that some particulate matter will inevitably be introduced into the storm drainage system. An effective on-site sediment control system would allow a majority of the particulate matter to settle out of the water prior to the water being released to the downstream drainage system. If only the smallest, lightest particles leave the site, in low enough volumes to be transported through the system while suspended in the water, they would cause no addition of sediment to the facilities.

Although the potential particulate build-up from the quarry would not necessarily be equivalent to an urban industrial area, the information regarding sediment loads, described in the previous section, indicates that the first three days following a storm or a wash down, account for the accumulation of a major portion of the solids in the build-up. Reduction of this build-up is difficult to achieve in unpaved areas because sweeping of the areas tends to raise as much dust as it removes. For this reason, it is all the more important that the on-site silt retention system be well maintained.

Because no increase in the amount of material to be mined is proposed, the threat of system siltation, although ongoing, would not be increased. The Surface Mining and Reclamation Act of 1975 requires sediment control during and after quarrying operations. Consequently, off-site siltation, generated by quarries must be minimized to allow mining to continue. The project sponsors proposed drainage modifications would fulfill the requirements of the Act for on-site retention of sediment. However, any failure of the proposed system, either through lack of pond cleaning or from berm-breaching could increase downstream sediment loads. Additionally, the system may or may not meet the EPA discharge standards expected to be issued by December 31, 1987. The EPA will be issuing regulations regarding discharges of stormwater from point sources. The state enforcing agency will be the Regional Water Quality Control Board. The new regulations will require permits for stormwater discharges to the waters of the state; the actual method of implementing the new regulations is unknown at this time, but local cities, counties, or districts may be required to file a permit application, on a watershed basis, with the regional boards. Some form of monitoring stormwater discharges will probably be required of industrial dischargers. Thus discharges from the project site would be regulated within the projected lifetime of the quarry.

Groundwater depressurization, also proposed by the project sponsor, is necessary to reduce stresses on the finished slopes. Without depressurization, additional slope failures would be expected where water was trapped in fissures or rock formations. The depressurization process would draw down the water table in the quarry slopes, and under adjacent upslope areas, discharging into the storm drainage system. No known contaminants occur in the local groundwater that would reduce the quality of the discharge water, however, a discharger's permit may be required.[10] The stability of the slopes achieved through depressurization would increase the safety of the quarry floor area for reuse and that of the upslope adjacent residential areas.

4.2.3 MITIGATION

The potential contribution from the quarry to the contaminant load is sediment. This would be effectively retained on-site by the proposed stilling and settling pond system, the revegetation of slopes for erosion control and the improvements to the on-site drainage system that carries stormwater runoff from the quarry faces to the basin and ponds, provided all the systems were maintained in operational condition. If the December, 1987 EPA standards for stormwater discharge are issued, those that apply to the quarry will be met. Although the project sponsors cannot reasonably be expected to anticipate what those standards will be, they are prepared to take appropriate measures, if necessary, once the standards are published.

The depressurization system would be monitored as part of the slope stability monitoring program described in the geotechnical section. No mitigation is currently deemed necessary for the quality of the groundwater to be discharged into the storm drainage system, however, because a CRWQCB permit may be required, the project sponsor may need to sample and analyze the groundwater prior to receiving the permit.[11]

The City of Oakland and Alameda County Flood Control District facilities that accept drainage downstream from the quarry are sized appropriately to accommodate existing runoff originating from the quarry site. The system currently is experiencing some siltation, which is an ongoing maintenance problem, but it is not clearly known whether or not the quarry is the source of that silt.[12] The City Department of Public Works and the

County Flood Control District should review the Hydrology and Drainage Plan with reference to the downstream facilities to ensure that adequate capacity exists in the system to continue to accommodate projected flows. Added volumes from the depressurization system are expected to be a fraction of a percent and would not constitute a major impact.[13] If improvements to the system are necessary, the public agencies involved should determine who is responsible for generating the need for improvements, who benefits from the improvements, and how those improvements should be funded.

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[1]Bissel & Karn, Inc. Hydrology and Drainage Report, Leona Quarry, November 16, 1984.

[2]Jack Lindley, Supervising Engineer, Alameda County Water Conservation and Flood Control District, telephone communication, September 26, 1986.

[3]USDA, "Standards and Specifications for Erosion and Sediment Control in Developing Areas," in Soil Conservation Service Standards and Specifications, 1975.

[4]Ron Wallace, Project Engineer, Bissel & Karn, Inc., telephone communication, October 22, 1986.

[5]Ron Wallace, October 22, 1986.

[6]Golder Associates, Leona Quarry, Geotechnical Reclamation Design, Volume I, May 1986.

[7]L.A. Roesner, "Quality of Urban Runoff" in Urban Stormwater Hydrology, Water Resources Monograph 7, D.F. Kibler, editor, American Geophysical Union, Washington, D.C., 1982.

[8]L.A. Roesner, 1982, op. cit.

[9]The amount and location of sediment that might be deposited in a channel are the result of the interrelationship of a number of variable factors within the drainage way. These factors include the size, shape and density of the individual particles in the system; the volume of particles entering the system; the volume of water in the system; the variation in rate with which the water travels through the system; the combination of methods by which particles are transported within the system (whether as bed load, i.e., rolled and bounced along the bottom, or as suspended load, i.e., floated); the geometry and capacity of the channel; and the material composition and roughness of the channel floor and walls. Equations are available to help quantify these factors in models of sediment transport systems for the purpose of attempting to predict where, and how

much, sediment will lodge in a theoretical system. The equations also can be used to help explain why sediment lodges in existing system. Models inherently carry precision limitations and uncertainties with respect to describing actual existing conditions or predicting future conditions. The relationships are complex and do not warrant extensive discussion in this document.

[10]Don Dalky, Environmental Specialist, California Regional Water Quality Control Board, telephone communication, September 26, 1986.

[11]Don Dalky, September 26, 1986.

[12]Jack Lindley, September 26, 1986.

[13]Paul Visca, Associate, Golder Associates, telephone communication, September 16, 1986.

4.3 VEGETATION AND WILDLIFE

4.3.1 SETTING

Leona Quarry, and the developing residential area which surrounds it, are part of a typical semi-coastal foothill landscape characterized by several natural plant communities. Habitats represented include Oak Woodland, Grassland, Chapparal, Riparian, and disturbed plant communities.

Oak Woodland is a community typical to the exposed slopes of the East Bay Hills. The dominant vegetation includes coast live oak (Quercus agrifolia), grasses and herbs. This community is found on the undisturbed northwest corner of the quarry property.

Grassland occurs on the site beneath oak woodland stands and in ravines. Native bunchgrass (Stipa pulchra) is the most common grass represented on the site.

Chapparal is a mixture of woody evergreen shrubs and is tolerant of poor site conditions such as little soil, steep rocky terrain, excessive drainage and drought. Dominant plants include chamise (Adenostoma fasciculatum) and California sagebrush (Artemisia californica). Chapparal occurs primarily along the north edge of the quarry and extends northward into an adjacent ravine.

Riparian vegetation has established around detention ponds and along drainage channels on the site. The dominant plant species include willow (Salix lasiolepis), cattails (Typha latifolia) and rushes (Juncus spp.). Riparian vegetation is particularly important for wildlife habitat and for the filtering of nutrients and other compounds carried downslope in runoff.

Disturbed areas are found throughout the quarry in storage areas, roadsides and old quarry faces. The most common plants are weeds including thistles, schismus and filarees.

The Leona Quarry site has sparse vegetation due to quarrying activities which have been carried out on the site over the past 76 years. This lack of vegetation, combined with slope, soil/rock type and color, cause the 125-acre quarry to be visually prominent from many vantages including San Francisco.

Existing vegetation on the quarry site occurs in pockets and scattered locations on slopes, along ridges, around detention ponds, and in disturbed areas.

Weeds have established in disturbed ground throughout the quarry, however, invasive weeds such as pampas grass and scotch broom, which are typical of other quarry sites, have not established to a significant degree here.

The site lacks a significant wildlife population, however, black goats and deer have been observed in the upper portions of the quarry, away from excavating activity. The most diverse wildlife habitat on the site is found in pockets of riparian vegetation surrounding detention ponds. Riparian vegetation provides valuable habitat for all types of wildlife, especially birds, including owls, red-winged blackbirds, ducks, geese, and winter wrens.

4.3.2 RECLAMATION/VEGETATION

Reclamation plans for Leona Quarry include extensive earth moving and revegetation. Reclamation of a given area will be on-going, commencing with the final cut of the quarry's walls. Slopes will be graded to include benches for erosion control and accessibility as well as planting. At this time no schedule for phasing of the work has been established; revegetation will occur as final slopes are reached.

The goal of a revegetation plan prepared in 1984 by Western Ecological Services Company (WESCO), are: to create long term semi-natural vegetation cover on the quarry's final cut wall which will assist in erosion control and eventually blend in with the surrounding landscape. The primary objective is to establish a viable plant community which will visually soften the quarry's appearance. Secondary objectives include erosion control, water quality protection, cost effectiveness and biological enhancement.

WESCO's revegetation plan identifies five types of soil/rock material which occur on the quarry site, and the capacity of each to support vegetation. Three types of Leona Rhyolite are described; each varies in its degree of fracturing, weathering and density.

1. Leona Rhyolite A. A highly weathered material, commonly found on the quarry's upper slopes. Grasses, forbs, and brush planted in these areas are expected to be uniform and moderately dense due to the presence of sufficient soil fines.

2. Leona Rhyolite B. Moderately hard and weathered, containing sufficient rock and soil particles to support a vegetative cover that would be less dense than Leona Rhyolite A.

3. Leona Rhyolite C. Relatively hard and little weathered, planting sites would need to be developed in these areas as there would be little soil to support vegetation.

4. Knoxville Shale. Highly weathered and fractured, generally occurring on the lower slopes of the quarry. These shale soils are rather infertile due to a high degree of acidity. The addition of lime and fertilizers would improve the stability of the shale to support vegetation.

5. Residual soils. Shallow to moderately deep and only marginally disturbed. Some earthwork and grading would be beneficial to promote revegetation in areas where gullies occur due to erosion. Grasses, forbs and tree seedlings are expected to do well in residual soils.

WESCO's revegetation plan proposes that a number of approaches be used in the reclamation/revegetation effort. Trees, shrubs, grasses, and forbs will be introduced to the quarry's final cut surfaces and slopes by hydromulching, hand seeding, and selective hand planting of seedlings and larger plant material. Test plots will be developed on unused slopes throughout the quarry to determine the success of hydromulch mixes, seedlings and fertilizer applications. Trial hydromulch applications will be refined so that ultimate treatment of final slopes is accomplished with proven methods.

Preparation of planting sites will involve establishing final slope angles, grading and contouring to provide drainage. Conventional site preparation, such as the application of topsoil, will not be possible due to slope steepness and lack of soil on the site. In some instances, topsoil or soil fines may be applied to benches to encourage successful plantings. Rocky areas without soil fines may require additional deep cutting during final grading, or in special cases, blasting may be required to establish planting holes of a sufficient depth for transplanted materials.

Table 4-1 shows vegetation which has been identified by WESCO as being suitable for the Leona Quarry site. WESCO's list identifies the site suitability of a plant and the method employed for application or planting. Generally, hydromulching would be the selected method of application in the areas of occurrence of Leona Rhyolite A and B.

Excavation of the quarry will be completed progressively; inactive slopes will be tested and monitored for successful hydromulching. Final revegetation will occur annually as the final slopes are completed. Final slopes will be seeded, planted and monitored then treated annually to assure adequate establishment of the desired plant cover.

During the initial years following any planting on the quarry site, maintenance will involve monitoring the success of the initial planting and additional application in bare areas. Plants will also be monitored for nutrient deficiencies and fertilizers will be applied as needed. Invasive weed populations such as pampas grass and scotch broom will be kept to a minimum on the site if a successful vegetation cover is established.

4.3.3 IMPACTS

WESCO's proposed revegetation plan, when implemented, will visually soften the harsh appearance of the quarry walls and aid in the control of erosion. In addition, the vegetative cover will significantly increase wildlife habitat on the site and encourage a diversity of species to establish in the area. Plants which will be used for revegetation are typical of Grassland, Oak Woodland, and Chaparral; therefore, wildlife typical to those areas would likely establish on the revegetated site.

The revegetation plan proposes that testing and monitoring of seed applications be performed to ensure that an adequate vegetative cover establishes. Annual application of seed and fertilizer will include areas which have had limited success.

Drought stress is anticipated to be the most likely factor leading to the success or failure of the revegetation scheme, particularly on slopes with a south exposure. In addition, invasive plant species or weeds may establish on the quarry's final cut walls.

TABLE 4-1

SUITABLE PLANT SPECIES FOR REVEGETATION AT LEONA QUARRY

Species	Site Suitability	Features
BASIC HYDROMULCH MIX FOR RAPID GROWTH		
Soft chess (Blando brome) *Bromus mollis*	all areas	drought resistant
Common barley *Hordeum* sp.	all areas	drought resistant
Annual ryegrass *Lolium* sp.	all areas	drought resistant
Lana vetch *Vicia* sp.	all areas	legume
BASIC HYDROMULCH PERENNIAL MIX		
Luna pubescent wheatgrass *Agropyron* sp.	all slopes except most southerly	
Palestine orchardgrass *Phalaris* sp.	all slopes except most southerly	
Rose clover *Trifolium* sp.	all slopes	legume
Soft chess (Blando bromus) *Bromus mollis*	all slopes	
Foxtail fescue *Festuca*	all slopes	
SHRUBS		
Deerweed *Lotus* scoparius	mod. slopes	legume, browse
Chamise *Adenostoma fasiculatum*	all areas	drought tolerant
Toyon *Heteromeles arbutifolia*	all areas	color
Coast sagebrush *Artemisia californica*	all areas	indigenous

TABLE 4-1 continued

Species	Site Suitability	Features
Black sage Salvia mellifera	all areas	indigenous
Coyote bush Baccharis pilularis	all areas	indigenous
California buckwheat Erigonium fasiculatum	all areas	
Sonoma sage Salvia sonomensis	all areas	creeping
TREES		
Monterey pine Pinus radiata		rapid growth dark color
Sargent cypress Cypressus sargentii	all areas	drought resistant poor sites
California bay Umbellularia californicus	draws	wind resistant
Douglas fir Pseudotsuga menziesii	protected sites/draws	rapid growth, very tall
Redwood Sequoia sempervirens	low areas	rapid growth, very tall
Gum trees (non-native) Eucalyptus spp.	all areas	adapted to very poor sites, very tall
Coast live oak Quercus agrifolia	protected sites	indigenous, slow growing
White alder Alnus rhombifolia	riparian	very tall
Fremont cottonwood Populus fremontii	riparian	very tall
Sycamore Plantanus recemosa	riparian	fall color

4.3.4 MITIGATION

Mitigation measures which are inherent in the revegetation plan include: testing hydromulch mixes to determine the most appropriate mix for a specific soil condition prior to application; monitoring all planting areas to determine the need for additional application of seeds or fertilizers.

Any surface soils existing in areas to be quarried would be stockpiled on the project site for eventual use in establishing some revegetation.

Additional mitigation is recommended for dry, exposed south slopes which could be subject to drought stress. Plant species should be tested in sensitive areas to determine drought tolerance, and an irrigation plan should be developed for areas with the greatest need. For aesthetic purposes invasive weed species should be controlled mechanically or chemically to prevent a dominant weed population from establishing.

Reclamation will be concurrent with quarrying. Permanent water-handling systems will be installed as the final slopes and benches are completed. Each year, prior to the winter rains, revegetation treatment will be applied to those areas of final slope developed during the preceding year. Any necessary reworking or repair of previously installed vegetation will be done at the same time.

4.4 VISUAL QUALITY

4.4.1 SETTING

The quarry faces southwest on the western ridge of the Oakland hills. This orientation faces many square miles of view-shed extending westward from Highway 580, outward over the Oakland bay plain and towards the San Francisco peninsula beyond. Of the 125 acres comprising the total site, about 79 acres are to be quarried. 89 acres are proposed for reclamation by slope treatment or future development. Elevations range from about 300 feet along the Freeway to over 1,070 feet at the eastern border of the site.

In its present condition, the site would be considered visually unattractive. It is visually discordant with its surroundings, not only because of the extent of surface disturbance, but also because of the steepness of the man-made slopes and their soil-color contrasts. Natural slopes to the north and south of the quarry site rang from 50%-70% gradient, while current working faces or abandoned slopes approach 120% gradient. Soil-color contrast is the consequence of exposed and weathered rock made up of Leona Rhyolite, covering about 75% of the quarry area. This rock weathers to a white to tan buff in the upper units (750') or orange-brown in lower elevations. The light color of this rock contrasts sharply with the olive to dark greens of the oak and chapparal plant communities covering the surrounding hillsides. It is the difference in light reflection between the quarry faces and adjacent native plant cover that most strikingly catches the eye.

The visual prominence of the site is determined by distance from it. Foreground views (0-½ mile) as seen from Highway 580 and areas immediately to the west or north will include detailed elements of the property. Observors will discern working faces within the quarry, as well as portions of the plant area, earth moving equipment and some processing or storage equipment near the plant area and yard. Portions of ground-level views into the site are partially screened by existing rows of pines and eucalyptus trees. Residential property near the south boundary of the site (Rifle Street, Altura Place) are screened from view by existing topography and vegetation. However, due to encroachment of the Ridgemont development adjacent to the nrothern site boundary, it is estimated that from 6 to 8 future residential units will experience oblique views into the quarry (see Figure 4-3 and 4-4).

SITE PHOTOS

FIGURE 4-3

A foreground view of Leona Quarry from Highway 580.

A middleground view from the residential area to the west of the quarry.

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SITE PHOTOS

FIGURE 4-4

Looking from the quarry towards the northwest over the Oakland bay plain.

Aggregate processing facilities from within the quarry.

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Most middle-ground views of the quarry ($\frac{1}{2}$-2 miles) are from residential neighborhoods west of Highway 580, although hilly terrain does block some of these views from lower elevations to the west. Observers at these distances can still see different faces along the upper portions of the quarry (see Figure 4-5).

Beyond 2 miles the site is part of a background view incorporating the surrounding hills. At this range the soil-color contrast with prevailing vegetation is the most discernable element. This can be seen, on clear days, from portions of San Francisco and the Peninsula.

4.4.2 IMPACTS

The project entails a proposed reclamation plan that includes final site grading, erosion and drainage control as well as a revegetation plan. In addition, other potential land uses such as single-family and multiple-family residential development could be accommodated at termination of quarry operations. These reclamation actions are described in several technical reports (Golder Associates, 1985; Environ, 1984; WESCO, 1984) and are herein incorporated by reference. It is the objective of these plans to improve site safety and appearance by implementing reclamation practices concurrently with mining operations.

Final site grading would create benches at regular intervals to stabilize cut slopes and to facilitate drainage and revegetation. The final grading plans would significantly improve the visual character of the site by blending and contouring face edges into a curvalinear form compatible with the adjacent natural slopes.

An important component of the reclamation plan in terms of visual quality is the revegetation plan. The proposed establishment of native grasses, woody shrubs and some ornamental materials would reduce the color contrast between disturbed slopes and the existing vegetation surrounding the site. The revegetation program establishes five management classes in the quarry working area based on rocktype, degree of weathering and disturbance. Each class has a prescribed assemblage of plant materials, and monitoring and maintenance programs. The establishment of viable plant communities would improve the site's appearance incrementally and would ultimately blend the property into the surrounding vegetation patterns. Revegetation techniques would include

SITE PHOTOS

FIGURE 4-5

Two views of the quarry from the southern boundary of the Ridgemount residential development.

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a combination of hydro-mulching, planting and seeding. Revegetation would occur annually as final slopes are completed. As the quarry operations near completion, final seeding, planting and monitoring would be conducted. Because of the long range nature of the quarry operations, it is not likely that visual quality benefits would be apparent during the first several years of the program, particularly as these improvements may affect long-range background views. The visual quality of the site will, however, improve incrementally and would be fully realized by the end of quarry operation. Subsequent development on the site could improve the appearance of the property by blocking views of cut slopes. Such development could enhance the site's appearance through the use of natural, non-reflective earth-tone facade materials.

4.4.3 MITIGATION

The existing plantings along the western property boundary fronting Highway 580 should not be disturbed and should be supplemented with additional plant material that would produce a denser evergreen screen between the site and the freeway.

The reclamation plan incorporates a number of specific features which will improve the visual character of the quarry upon completion of mining activities. The final grading plans would develop regular benches and contour the face edges into a curvalinear form to blend with adjacent land forms. The revegetation plan would introduce grasses and shrubs which would soften the appearance of the quarry face and blend with native vegetation.

4.5 LAND USE

4.5.1 SETTING

Leona Quarry is situated in an area characterized by steeply sloping hillsides, with existing low density single family housing on three sides. Although quarry operations predate most development in the area, the land surrounding the site is undergoing gradual urbanization.

Leona Quarry is accessed at a single gateway along its western boundary from I-580 via Edwards Avenue or from 73rd Street via Edwards Avenue. The quarry site has no other authorized vehicular access point. Although the steep hillsides on the northeast, north, and southeast prevent vehicular access, adjacent property owners have offered open slopes to the East Bay Regional Parks District. A regional trail is contemplated on these slopes at a future date to link with the existing York Trail.[1]

On the southeast, is a low-density single family residential area that is entered from Rifle Lane, off Mountain Boulevard. Although homes and other buildings extend about half way up the quarry boundary line, quarry operations generally cannot be seen or be heard from these homes. Existence of an upslope and wooded open space between the homes and the quarry edge provide a buffer zone.

On the quarry's northeast side, the Ridgemont residential development is building clusters of single family homes on the crest of the hill. These homes are accessed from Campus Drive which connects to Redwood Road to the north and Keller Road to the south. Merritt College lies just behind the hills crest on the east side of Campus Drive.

New residential development is being constructed along campus Drive extending south of Merritt College and Ridgemont. Small cul-de-sacs enter Campus Drive as it extends south behind the quarry site. Building pads have been leveled overlooking the quarry site along its north boundary. Quarry operations could not be seen, but trucks could be faintly heard in the distance. Further residential development seems imminent on Campus as it extends further south.

The quarry is a visual and sometimes an audible presence to the residential areas around its perimeter. The extent of its visibility depends on the location it is viewed from; some locations are more affected than others. At no point on its residential boundary was it deemed to have an excessive influence in terms of its visual or noise impacts.

The Existing Land Use Map - 1978 in the Land Use Element of the Oakland Comprehensive Plan (April, 1980) shows the location of Leona Quarry with a great deal of vacant land around it, and with the area to the southeast identified as suburban residential (10,000 or more square feet of land or more per unit).

Approximately one-half of the quarry site is zoned R-50. A 30-foot deep strip of R-40 zone land, 300-foot long parallelling Mountain Boulevard exists on the south westerly edge of the quarry, as shown on the existing zoning map in Appendix C. The remainder of the site is zoned R-30. R-50 zones, Medium Density residential zones, are intended to create and enhance areas for apartment living at medium densities. Single-family and multi-family dwellings are also permitted. The area surrounding the quarry, on the northeast, north, and northwest is also zoned R-30. R-30 zones, one-family residential zones, are intended to create, preserve, and enhance areas for single family dwellings. Each lot in R-30 zones is required to have a minimum lot size of 5,000 square feet.

Leona Quarry is considered a primary resource by the Office of Emergency Service (OES). Material from the quarry would be vital to the recovery of the City of Oakland following a city-wide disaster, such as a major damaging earthquake. The quarry owners, Gallagher & Burk, Inc., have offered OES the use of the site for part of the City's Emergency Preparedness Program. OES is interested in the quarry because of its general seismic stability and its relatively open areas. OES is considering use of the site as a staging area (for the transfer of materials and supplies) and as an emergency backup storage area (for equipment and rubble). Emergency Plan use for the site is still in the concept phase.[2]

4.5.2 IMPACTS

The Leona Quarry Reclamation Plan briefly describes the use of the site subsequent to completion of mining activity at Leona Quarry and reclamation. Four areas would be available for development. The project sponsor has identified a variety of possible future uses for the four areas. Those uses are summarized below.

Areas 1, 2 and 3 are located within the existing quarry and surrounded by reclaimed slopes on three sides. The three areas are accessed from Edwards Avenue and Mountain Boulevard. A roadway would connect the three areas together and to Edwards. Area 4 is located at the top of the quarry's east slope and separated from the first three areas by the slope. It is accessed from Campus Drive.

Area 1 (20.8 acres) is located closest to proposed access from Edwards Avenue at the base of the existing quarry, and it is suggested in the sponsor's reclamation plan for single-family residential lots, medium or high rise multiple housing, commercial development, light industry, institutional use, or recreation.

Area 2 (14.7 acres) is located to the east of Area 1 and slightly above it. The proposed reclamation plan could be adaptable for single family residential lots, medium or high rise multiple housing, light industry,institutional use, or recreation.

Area 3 (2.6 acres) would be a level shelf to the east of and above the first two areas. It would afford some views, and the reclamation plan is suggests light industry, institutional use or a park.

Area 4 (6.6 acres) is located at the top of the quarry and has a view of the entire Bay Area. The sponsor's reclamation plan is suitable for single-family development.

The reclamation plan presents a wide variety of possible land uses for the reclaimed quarry bottom. Areas 1, 2 and 3 together form an independent unit that is isolated from the surrounding land uses by nature of the steep slopes on three sides and having access from the west only. These areas could be developed together or independently. The activities within the quarry site would have little impact on the bordering residential use. A more important consideration is the internal compatibility of uses developed within the three areas in the quarry. All three areas share one entrance and exit road. Their uses will by necessity be more integrated than is usually the case.

Area 4 is separate from the first three areas and must almost certainly become single family residences. Construction along Campus Drive is progressing rapidly. By

completion of the reclamation plan, it will probably be the only remaining unbuilt land along the hill's crest.

The Illustrative Future Land Use Map in the Land Use Element of Oakland's Comprehensive Plan shows the quarry site as suburban, low-density residential (one dwelling unit per 10,000 square feet of lot area) with a park, recreation nature area or watershed designation in the buffer area between the quarry site and the freeway. This is the City's development policy and it clearly indicates that the commercial/industrial and high-density residential uses would be precluded from this area. Therefore, at this time only single-family residential units would be acceptable on the R-30 zoned portion of the site in the reclamation plan and only medium-density residential units would be allowed in the R-50 zoned portion.

If the quarry permit is extended as requested, there is a chance that the ultimate land use shown on the General Plan could be modified; however, Planning Department staff feels that is unlikely that the plan would permit Industrial, Commercial or High-Density residential as suggested in the Reclamation Plan.[3] If the quarry use is extended for 40 years, the acreage in the quarry could represent a significant amount of available land for infill development or recreational use.

4.5.3 MITIGATION MEASURES

None necessary.

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[1] Source: Franklin Erhardt, Senior Planner, written communication, February 24, 1987.

[2] Henry Renteria, Emergency Services Coordinator, City of Oakland, telephone communication, October 20, 1986.

[3] Op. Cit. Franklin Erhardt.

4.6 TRANSPORTATION

4.6.1 SETTING

The project site is located at the intersection of Edwards Avenue and Interstate 580 (I-580) in Oakland. I-580 is a primary regional traffic artery that leads from San Francisco and the Bay Bridge east through Oakland to communities beyond the East Bay hills. Edwards Avenue, a narrow residential street, is an extension of 73rd Avenue and Hegenberger Road; the combination of which provides an important east-west connection between Highway 17, Bancroft Avenue, MacArthur Boulevard and I-580. Both I-580 and the Edwards, 73rd, Hegenberger connection are important elements of Oakland's traffic network in East Oakland.

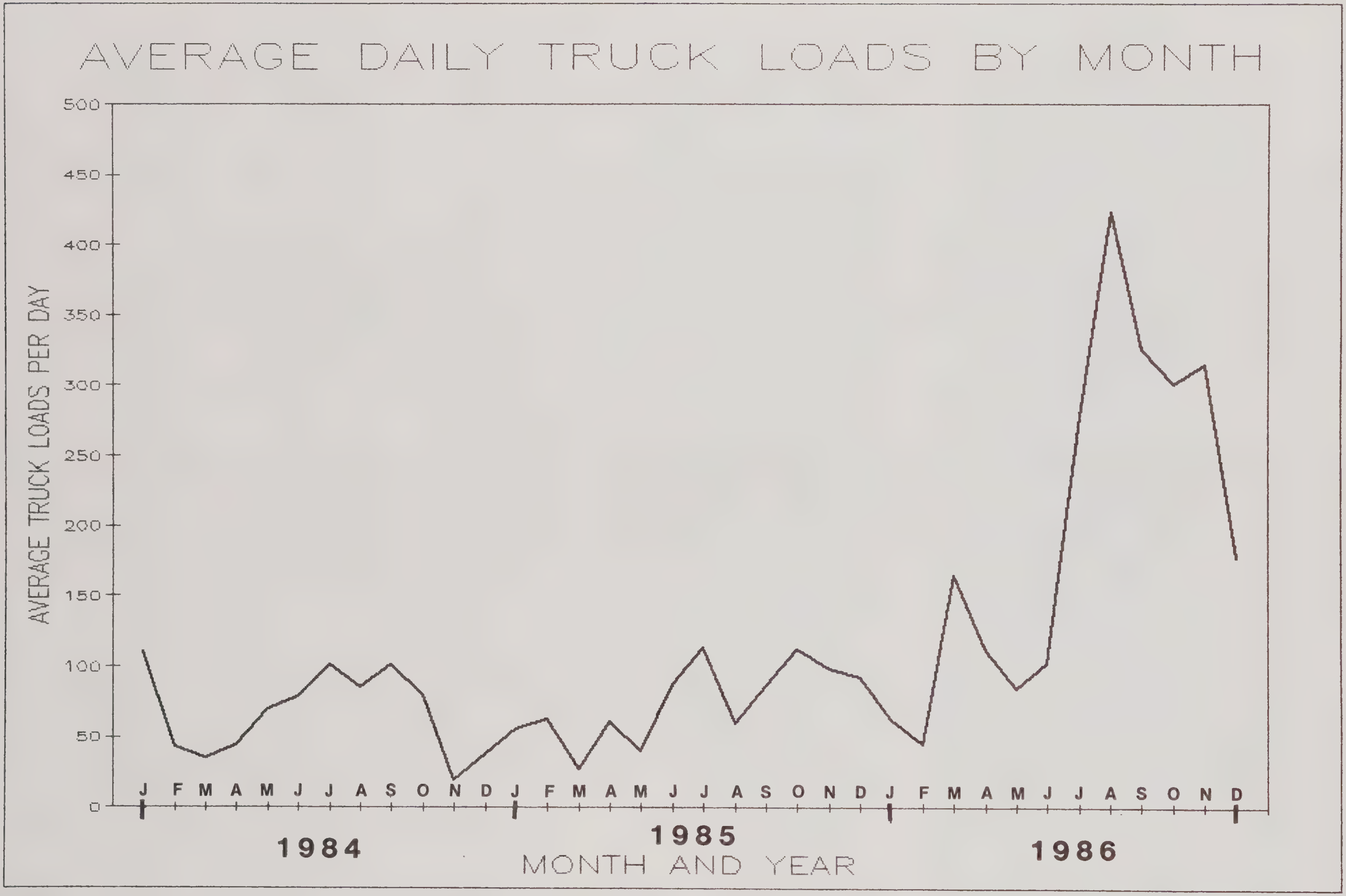
Edwards Avenue forms a partial interchange with I-580, serving traffic from the northwest only. Edwards Avenue climbs the hills through a residential neighborhood to Leona Quarry and runs directly to the quarry gate from its intersection with 73rd Avenue. I-580 crosses over Edwards Avenue 100 feet in front of the quarry gate. Mountain Boulevard runs parallel to I-580 on the quarry side of the freeway, and becomes a westbound on-ramp (towards San Francisco) to I-580 after it crosses Edwards Avenue. It does not continue as a frontage road along the quarry site. An eastbound off-ramp decends from I-580 and terminates at Edwards. The I-580 off-ramp to Edwards is controlled by a stop sign. There is a stop sign on Mountain Boulevard where it meets Edwards.

Traffic in the a.m. peak-hour is heavy on Edwards due to drivers leaving the residential areas just below the freeway and using the Edwards on-ramp to access I-580 for jobs in downtown Oakland or San Francisco. Traffic in the p.m. peak-hour is heavy on the off-ramp to Edwards as workers return from these same areas.

The quarry is a seasonal business that peaks during the summer construction season. Consequently, quarry traffic is highest between May and September, and very low during the winter months. Most of the trucks using the quarry are operated by independent owner-operators. Leona Quarry has four trucks that are based at the quarry that work out of it exclusively.

During a normal summer season, there are about 180 truck trips per day to and from the quarry.[1] This number can double for the duration of large jobs such as landfill operations.

FIGURE 4-6



AVERAGE DAILY TRUCK LOADS BY MONTH
AVERAGE TRUCK LOADS PER DAY
500
450
400
350
300
250
200
150
100
50
0
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1984
1985
1986
MONTH AND YEAR

Based on truck trip and tonnage data provided by the Leona Quarry, about 90 truck loads of material leave the site (180 truck trips per day, one trip in, one trip out) during a normal summer season day. The actual number of truck trips varies on a day-to-day and month-to-month basis. For the years 1984 and 1985, average-daily truck trips in the summer months were as low as 118 trips per day and as high as 226. In 1986, truck activity increased dramatically due to large filling activities at the Port of Oakland. Truck trips peaked at approximately 850 trips per day in August, 1986. This high level of quarry activity is a departure from "normal" summer quarry activity and is not expected to continue indefinitely. Figure A shows the average-daily truck loads from the quarry for the years 1984 through 1986. The years 1984 and 1985 show relatively stable quarry truck activity with peaks in the summer and early fall. A dramatic increase in activity is evident in the summer of 1986. Appendix B shows the average-daily truck loads from the quarry for each month in 1984, 1985, and 1986.

An average of 1,790 tons per day was transported from the quarry in the average summer month in both 1984 and 1985. The average-daily tonnage jumped to 6,770 in the summer of 1986. The averagedaily tonnage for 1984 through 1986 is also shown in Appendix B.

The estimated quarry production per year for the next ten years is 1,000,000 tons per year.

During a field survey conducted by EIP Associates, truck trips to and from the quarry entrance averaged about 1.5 per minute in the late morning, which would tend to confirm the trip-generation estimate given above.[2] Truck operations normally start at 7:00 a.m. and continue steadily until 4:00 p.m. Traffic at the quarry gate seemed to flow smoothly even though truck traffic was heavy at the time of observation.

A variety of trucks use the quarry, ranging from tractors with double trailers to smaller ten-wheel dump trucks to pick-up trucks.

In general, any route except I-580 is available to quarry trucks. Trucks are prohibited from using I-580 within Oakland City limits. However, trucks going to and from the quarry are permitted to use I-580 between Seminary and Edwards Avenue eastbound, and between Edwards and State Route 13 westbound. Quarry trucks are permitted to travel

down Seminary to Bancroft Avenue, San Leandro Boulevard, or Highway 17 on their way to the job sites in downtown Oakland or elsewhere. Trucks traveling east from the quarry are required to travel along the frontage road until they are outside Oakland City limits. Roughly two-thirds of the quarry trucks turn onto the I-580 ramp and head west and one-third head east along the frontage road.

The quarry also has a self-imposed restriction on the use of Edwards Avenue between the quarry and MacArthur Boulevard.

4.6.2 IMPACTS

The reclamation plan indicates that the rate of excavation, and therefore truck traffic, is not expected to increase over the period of the quarry permit. The quarry is an existing use that has maintained a steady volume of traffic over the previous years as the area around it, particularly the hills to the north and east, have become residential areas. Mixing large trucks with auto traffic is generally considered undesireable, but given the location of the quarry and the nature of the terain, there is no feasible alternative to the present access point.

Impacts from the quarry and future operations are not expected to change from existing conditions. The presence of large trucks will remain an irritant to auto drivers. There is no evidence that their presence is hazardous.

4.6.3 MITIGATION

None necessary

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[1] Quarry Records on daily truck loads, and tonnage provided by Tom Rolleri, Vice President and General Manager, Gallagher and Burk, Inc. for the years 1984, 1985 and 1986.

[2] EIP Associates, field survey, August 20, 1986.

4.7 AIR QUALITY

4.7.1 SETTING

Oakland's climate is generally mild, with maximum summer temperatures averaging in the 70's F occurring in July and minimum winter temperatures averaging in the high 30's F. Winds, as measured at Oakland International Airport and the Alameda Naval Air Station are primarily from the west with a secondary frequency maximum from the southeast, perhaps reflecting drainage flow from the Hayward Gap. Winds are strongest and most persistent in the spring and summer. Figure 4-6 is a diagram showing the distribution of wind directions and speeds in the Oakland area based on data collected at the Alameda Naval Air Station. The most stagnant meteorological conditions occur during cold winter evenings and can lead to build-ups of carbon monoxide (CO); in the summer the sunny and hot weather throughout the Bay Area can lead to regional build-ups of ozone.

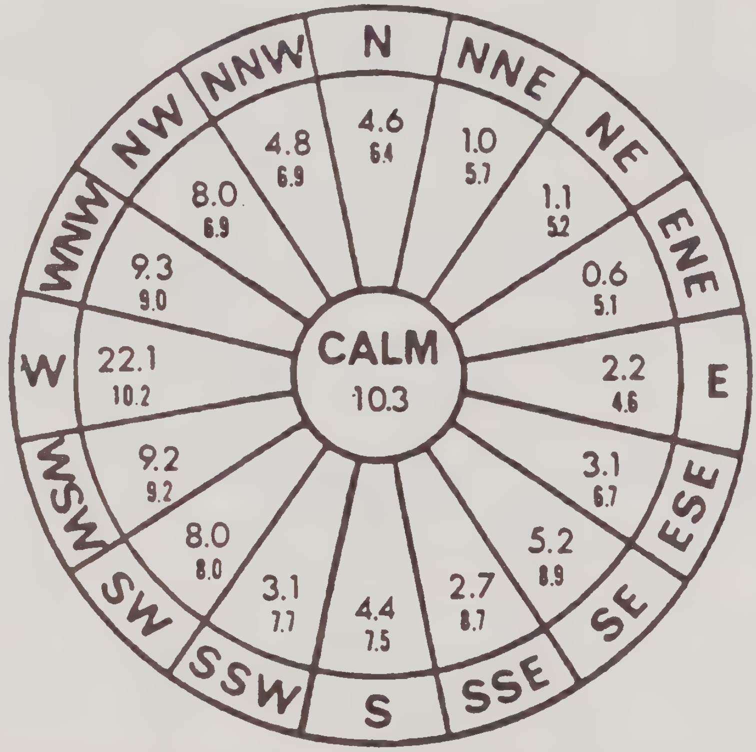
The Clean Air Act of 1967, as amended, established air quality standards for several pollutants. The standards are divided into primary standards, designed to protect human health, and secondary standards, intended to protect the public welfare from effects such as visibility reduction, soiling, nuisance and other forms of damage. In addition, the State of California has adopted its own standards. The federal and state standards described in Table 4-2 provide acceptable durations for specific contaminant levels that are designed to avoid adverse effects within a margin of safety.

CO and ozone air quality are measured by the Bay Area Air Quality Management District (BAAQMD) at Oakland and San Leandro. No other pollutants are monitored at these stations. A summary of measurements at these stations for the most recent three years for which data is available is shown in Table 4-3. A comparison of Tables 4-2 and 4-3 indicates that air quality in the Oakland area generally complies with the air quality standards. However, ozone air quality in San Leandro has been in violation of air quality standards for the last three years.

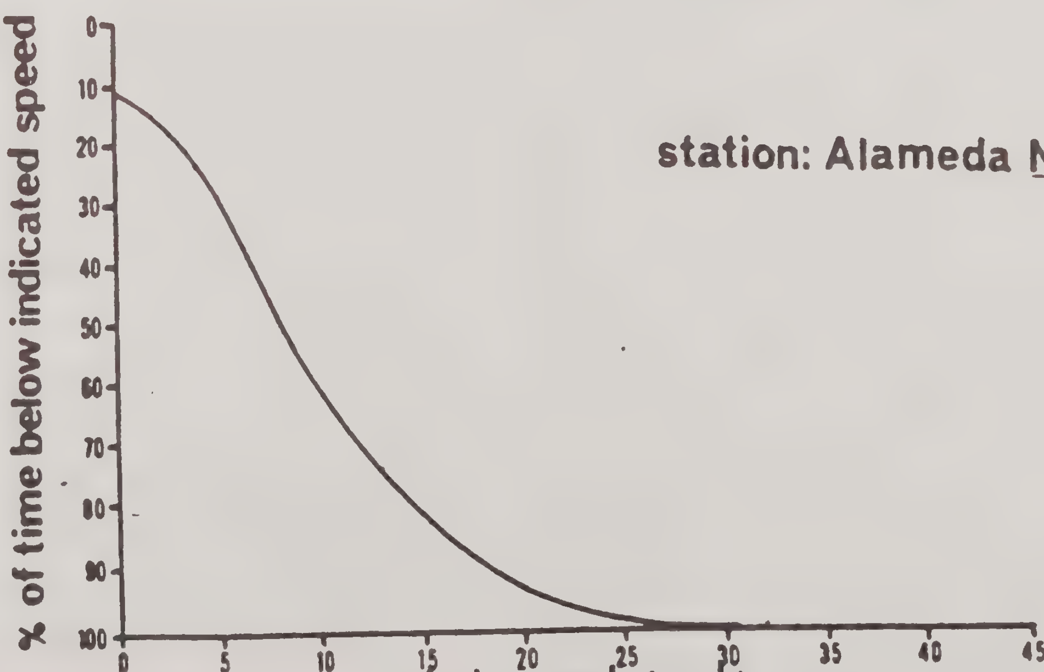
It should be noted that elevated CO concentrations often result from localized emissions, so data collected at the BAAQMD monitoring stations may not represent conditions at the project site. In contrast, elevated ozone concentrations generally occur over a wide area; ozone levels at the project site are likely to be more similar to those at the monitoring stations. This data does not indicate whether or not ozone air quality in the project vicinity is in violation of air quality standards.

WIND SPEEDS AND DIRECTIONS IN THE OAKLAND AREA

FIGURE 4-7



percentage distribution of wind directions with mean wind speed beneath



cumulative wind speed distribution

eip

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TABLE 4-2

COMPARISON OF FEDERAL AND STATE

AIR QUALITY STANDARDS

Pollutant Averaging Time	Federal Standards Primary	Federal Standards Secondary	State Standard	Objective
Ozone				To prevent eye irritation, breathing difficulties.
1-hour	0.12 ppm 240 $\mu g/m^3$	Same —	0.10 ppm 200 $\mu g/m^3$	
Carbon Monoxide				To prevent carboxyhemoglobin levels greater than 2%.
8-hour	9 ppm 10 mg/m^3	Same	—	
1-hour	35 ppm 40 mg/m^3	Same	40 ppm 46 mg/m^3	
12-hour	—	—	10 ppm 11 mg/m^3	
Nitrogen Dioxide				To prevent health risk and improve visibility.
Annual	0.05 ppm 100 $\mu g/m^3$	Same	—	
1-hour	—	—	0.25 ppm 470 $\mu g/m^3$	
Sulfur Dioxide				To prevent increase in respiratory disease, plant damage & odor.
Annual	0.03 ppm 80 $\mu g/m^3$	—	—	
24-hour	0.14 ppm 365 $\mu g/m^3$	—	0.05 ppm 131 $\mu g/m^3$	
3-hour	—	0.5 ppm 1310 $\mu g/m^3$	—	
1-hour	—	—	0.5 ppm 1310 $\mu g/m^3$	
Sulfates				To improve visibility and prevent health effects.
24-hour	—	—	25 $\mu g/m^3$	
Particulate				
Annual Mean	75 $\mu g/m^3$	60 $\mu g/m^3$	60 $\mu g/m^3$	To improve visibility.
24-hour average	260 $\mu g/m^3$	150 $\mu g/m^3$	100 $\mu g/m^3$	
Visibility Reducing Particles	State Standard: One observation. In sufficient amount to reduce the prevailing visibility to less than ten miles when the relative humidity is less than 70%.			
Lead				
30-day	—	—	1.5 $\mu g/m^3$	To prevent health problems.
Calendar quarter	1.5 $\mu g/m^3$	Same	—	
Hydrogen Sulfide				
1-hour	—	—	0.03 ppm 42 $\mu g/m^3$	To prevent odor problems.
Hydrocarbons				
(Corrected for methane) (3-hr. avg. 6 am-9 am)	0.24 ppm 160 $\mu g/m^3$	Same	—	To prevent emission of an ozone precursor.
Vinyl Chloride				
(Chloroethene) 24-hour	—	—	0.010 ppm 26 $\mu g/m^3$	To prevent health problems
Ethylene				
8-hour	—	—	0.1 ppm	To prevent plant damage.
1-hour	—	—	0.5 ppm	

Source: Bay Area Air Quality Management District, Air Quality Handbook, 1981-1982, San Francisco, California, page 22.

TABLE 4-3

MEASURED AIR QUALITY IN SAN LEANDRO AND OAKLAND

1983-1985

	1983		1984		1985	
	Oakland	San Leandro	Oakland	San Leandro	Oakland	San Leandro
Ozone[1]	12/0/0.0	19/3/1.4	11/0/0.0	15/3/2.4	12/0/0.0	7/0/2.1
CO[2]	7.3/0	-	8.0/0	-	5.8/0	-

[1]The first value is the maximum hourly average concentration in ppm. The second value is the number of days on which a violation was recorded. The third value is the Expected Annual Exceedance (EAE); EAE refers to a three-year running average of ozone concentrations adjusted for equipment downtime.

[2]The first value is the maximum 8-hour average in ppm. The second value is the number of day son which a violation was recorded.

Air quality at the project site is checked annually by the BAAQMD. These checks are to verify that the requirements of BAAQMD Regulations are met. Regulation 6, Section 301 states that the opacity of the air at the project site should not exceed 20%. This is a mild, but noticeable degradation in visibility. In addition, Regulation 10, Rule 46 specifies that new machinery (installed after August 31, 1983) is subject to more stringent standards, i.e., no more than 15% opacity near rock crushers and no more than 10% opacity around other sources. If an exceedence occurs, control must be regained within three minutes. The most recent violation was recorded in 1975 due to coarse material dropping off a conveyer belt and dropping onto the ground. This source of emissions was controlled with water spraying, as are other sources of particulate emission in the quarry.

The principal air quality problems in the project area are elevated concentrations of ozone and possibly particulate matter. High concentrations of ozone produce eye irritation and respiratory function impairment. High concentrations of CO can impair oxygen transport in the bloodstream, aggravate cardiovascular disease, impair central nervous system functioning and cause fatigue, headache, dizziness and confusion. Long exposure to high particulate concentrations can interfere with respiratory function and, in combination with atmospheric sulfur dioxide (SO_2), produce acute illness.

As a result of the violations of CO, ozone and TSP standards in various parts of the Bay Area, an Air Quality Plan for the Bay Area was prepared in 1979 as part of the Environmental Management Plan by ABAG and other governmental agencies.[1] The 1979 Plan contains strategies for the long term attainment and maintenance of the air quality standards. It includes measures to reduce emissions from stationary sources and automobiles and suggests transportation control measures to reduce automobile emissions. The air quality problems addressed in the 1979 Plan are photochemical oxidants (principally ozone), CO and TSP. In 1982 the Plan was updated to assure compliance with ozone and CO standards by 1987.[2] The key CO strategies included in the Plan involve Inspection and Maintenance (I&M) of motor vehicles and various transportation controls. In 1984 a mandatory statewide I&M program was adopted. It is expected to result in a 16% reduction in CO in the Bay Area.

4.7.2 IMPACTS

Quarry Operations

Quarry operations produce emissions of particulate matter due to the disturbance of exposed earth surfaces caused by the action of equipment, blasting and wind. There are also emissions from motorized equipment and vehicles used in the quarry operations and by the employees and visitors.

According to Michael Plumer, Superintendent of the quarry,[3] the proposed project would not result in an increase of working faces of the quarry or in the amount of equipment or vehicles used for quarry operations. Mr. Plumer reported that the proposed project also could result in future working faces more distant from the nearest existing residences, compared with the current working faces, depending on the amount and type of material quarried. The material to be quarried in the future also is harder and therefore less likely to generate particulate emissions than current materials. Based on this information it does not appear that any increase in the generation of particulate matter would occur due to the proposed project. In addition, the increase in distance to the nearest existing residences would tend to decrease the concentrations of particulate matter at the nearest residences. However, new residences built closer to the quarry would be exposed to higher particulate concentrations than are existing residences.

Local CO and Regional Ozone Impacts

Since no change in vehicular travel or equipment use would occur, no change in emissions of CO or hydrocarbons or nitrogen oxides (the pollutants which lead to ozone formation) would occur. As a result the project would have no impact on concentrations of any of these pollutants.

Significance of Impacts

No significant air quality impacts would result from the proposed project.

4.7.3 MITIGATION MEASURES

Since the project would not produce significant air quality impacts no mitigation would be required. It is noteworthy, however, that the quarry would continue to control particulate

emissions with two major control methods. First, water spraying keeps travelled surfaces and equipment damp, and thereby reduces the amount of generation of fugitive dust. Second, exposed earth surfaces will be replanted as soon as final slopes are achieved to reduce the amount of soil erosion.

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[1] Association of Bay Area Governments, Bay Area Air Quality Management District and Metropolitan Transportation Commission, "1979 Bay Area Air Quality Maintenance Plan," Berkeley, California, 1979.

[2] Association of Bay Area Governments, Bay Area Air Quality Management District and Metropolitan Transportation Commission, "1982 Bay Area Air Quality Maintenance Plan," Berkeley, California, 1982.

[3] Michael Plumer, telephone conversation, September 22, 1986.

4.8 NOISE

4.8.1 SETTING[1]

The existing noise environment in the vicinity of Leona Quarry consists mostly of highway traffic generated sounds. The operation of the quarry equipment generates noise within the quarry but generally appears to be contained by the shape of the quarry walls.

Blasting is usually done midday and occurs on an as-needed basis, varying from about two shots per month to about two shots per week. Since about 1982, a sequential blasting technique has been used. This technique provides an incremental delay between the detonation of each charge in the blasting sequence, thereby damping the noise and vibration from the shot. The quarry operator's report that they have received a complaint regarding blasting noise about once every five years over the past two decades. In each case the complaint has come from the residential area near the southeast rim of the quarry. No complaints have been received from the residential areas across the MacArthur Freeway. This is probably because the blasting noise is in a low frequency range and is masked by the freeway noise.

4.8.2 IMPACTS

Because no new equipment, including haul trucks, is being added to the operation, noise levels are expected to remain about the same as they are now. The use of the noise- and vibration-reducing sequential blasting technique would be continued. To the extent that new development occured around the rim of the quarry, more people could be within hearing range of the blasting. Therefore, it is possible that more complaints could be received even though no increase in blasting occured.

4.8.3 MITIGATION

Assuming that blasting occurs about as often in the future as it has in the past, that sequential blasting continues to be used and that shots generally continue to be timed for midday, no further mitigation seems necessary.

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[1] Information on blasting schedules from Tom Rolleri, Vice-President, Gallagher & Burk, Inc., personal communication, 21 October 1986.

4.9 PUBLIC SAFETY

4.9.1 SETTING

An expressed concern of the City is the safety of adjacent residents and unauthorized visitors to the quarry area. This issue is one common to all surface mining operations and must be considered from two perspectives: first, during the operating lifetime of the quarry and second during the period of reuse after the quarry has been reclaimed for residential, open space or other possible uses.

During the operating lifetime of the quarry, work safety standards are established by the California Mining Safety Orders.[1] That document provides the framework for both employer and employee safety and, having the force of law, is in effect at every operating pit and quarry in the state. However, Safety Orders apply to those persons having legitimate access to the site for the various purposes involved in operating the pit or quarry. It is the responsibility of the owner to make reasonable efforts to prevent unauthorized persons from gaining access to a site considered to be potentially hazardous. Prevention of unauthorized access (trespassing) is the mainstay of the public safety program for any quarrying operation. However, despite good faith endeavor, it is not possible to eliminate all trespassing, nor is it feasible to take extraordinary precautions for the protection of trespassers.

At Leona Quarry, trespassing is discouraged by signs posted along the perimeter of the property. Chain link fencing and triple strand barbed wire fencing are used to separate the lower levels of the property from the public right-of-way and to indicate the entrance for trucks, quarry workers and legitimate visitors to the site. Access for excavation of the upper areas (working faces) of the quarry is gained only through the lower levels, where quarry employees are on-site at least eight hours of each business day. Access from Campus Drive to the top of the quarry is restricted by a berm and chainlink fence. The generally rugged terrain adjacent to the quarry also has acted as a deterrent to trespassing in the past. Triple strand barbed wire fencing exists along Ridgemont and Viewcrest.

It is a policy of the project sponsor, Gallagher & Burk, Inc., that employees be observant of unauthorized persons entering the site and to prevent such entry whenever possible.

There are no roads within the plant area of the quarry leading to the upper faces that cannot be observed by employees. However, the crest areas above the working faces cannot reasonably be expected to be policed by quarry employees.

4.9.2 IMPACTS

The continued operation of the quarry would not generate any new risks for the on-site employees because they would continue to work under the jurisdiction of the Mining Safety Orders. The use of the geotechnical consultants mining plan would assure stability of the slopes during the mining phase.

The increase in development on adjacent properties would expose more persons to possible falls because unauthorized entry can be expected to increase proportionally to the population rise in the area. The increase in exposure may be offset to some extent by a "settlement factor." That is to say, as the area developed, more lots would be fenced and the residents would be intolerant of trespassing, thus acting as a buffer between the quarry walls and unauthorized public access. If lands were offered for dedication to the East Bay Regional Park District, access from those lands would have to be mitigated in some other way, acceptable to the District.

Increased residential development on nearby properties also poses a threat to the stability of the quarry faces during and after completion of mining. Added irrigation water and water from leaking swimming pools would percolate into the underlying bedrock. This process could increase the pore water pressure in existing slopes sufficiently to create slide-prone conditions. The depressurization system discussed in Section 4.2, Hydrology, of this report, is intended to counteract this effect by draining water from the slopes.[3]

In the post-operational phase, the flattened areas of the quarry floor and the flattened top of the upper face along Campus Drive could be developed for recreational purposes, residential lots or other permitted uses. The safety issues involved include (1) the stability of the final slopes and (2) personal hazards.

Slope stability is influenced by structural limitations, drainage and susceptibility to the effects of vibration, as discussed in the geologic section of this report. Material falling off those slopes due to rock raveling, slump failures of overburden or bedrock landslides

would pose hazards to persons, vehicles and structures at the base of the slopes if measures had not been taken to ensure stability of the slopes in their final form. The types of slope failures commonly expected from redeveloped quarry slopes and the dangers involved may be described briefly as follows.[2]

- Raveling, or the loosening of the rock face by weathering, occurs on all moderate to steep rockslopes that are fractured or jointed. The dislodged material is usually of pebble to cobble size, does not generate major debris falls and is principally of danger to persons or vehicles at the base of the slope at the time of the rockfall. Catchment systems, such as basins or restraining walls usually are employed to prevent injury or damage. A basin is proposed at Leona Quarry, at the base of geotechnically designed stable slopes. Further detail is given in Section 4.1, Geology, of this report.

- Flowing or slumping of unconsolidated surface soil caused by water saturation, undercutting, seismic shaking, etc. can occur on unmitigated, moderate to steep, soil covered slopes or where the bedrock decomposes to fine-grained material. Such flows may damage walls, but do not pose major hazards to buildings. The removal of superficial deposits, terracing of slopes and drainage of hillsides are commonly used to prevent saturation of the surface of the slopes. All these procedures are proposed in the Leona Quarry reclamation plan. Further information is given in Section 4.1, Geology, of this report.

- Landsliding, or the failure of the bedrock slope along bedding planes, joints, shears, fractures, etc. generally can occur on unmitigated, very steep slopes in highly fractured or sheared rocks, or where bedding or shear planes dip steeply in the same direction as the face of the slope. Such slides can involve tons of rock and can cause death or injury to people and severe damage to structures located below or above the slide block. Removal of all or portions of the slide-prone mass, buttressing of existing slides, dewatering to reduce groundwater pressure, sloping and terracing of rock faces to a stable configuration and cutting rock faces to take advantage of bedding/fracture structures are techniques used to avoid landsliding. All these techniques are proposed in the Leona Quarry reclamation plan. Further detail is given in Section 4.1, Geology and 4.2 Hydrology, of this report.

The above-described mitigations typically are applied to slopes steeper than 2:1 that are no longer being worked and that cannot be graded down. However, in the case of Leona Quarry, the project sponsor proposes to quarry the rock in such a way as to grade the faces to geotechnically designed stable slopes, thus reducing the possibility of failure. Existing slide-prone material would be buttressed or removed through the reclamation plan. A buffer zone would be provided between the reuse areas and the final slopes as mining of the site approached completion. The terraces and basin would act as catchment zones for material that ravelled off the slopes.

Personal hazards in the post-operational period, other than ravelled debris falls, include access to the quarry slopes themselves and access to the basin. Persons climbing on the rehabilitated faces of the quarry or along the sides of the basin would risk injury by falling off the slopes. Because the final slopes would be stepped with wide benches, a fall from these stepped slopes would be shorter than a fall from most nearby natural slopes. Either natural or man-made slopes at the site could cause injury or death to a person falling from them. The basin, which also acts as part of the drainage system could also pose potential drowning hazards during a major rainfall. As with the operational phase of the project, the major public safety hazard is unauthorized access.

During the post-operational phase population within and adjacent to the quarry site would again rise, thus increasing, further the possible number of injuries from falls. The previously described "settlement factor" would act to slow the rate of increase, but it is not possible to quantify its effect. If any of the quarry lands were dedicated to the East Bay Regional Park District for inclusion in its contemplated regional hiking trail, access from the trail would have to be mitigated in some other way, acceptable to the District.

4.9.3 MITIGATION

The hazard of debris slides is expected to be minimal because (1) the project sponsor would use the geotechnical consultant's mining plan to establish stable, stepped quarry slopes, (2) the proposed basin, which is as much as 15 feet deep, would act as a catchment area for any debris from raveling or overburden slumping, and (3) the dewatering system (described in the hydrology section as the depressurizing system) would reduce the destabilizing effects of groundwater trapped within the quarry walls.

For the post-operational phase, there is no further geotechnical mitigation that can be implemented effectively at this time to further ensure the stability of the slopes. The proposed final slopes have been designed to a stable configuration by the project sponsor's geotechnical consultant. As the faces are cut they would be monitored for stability under the proposed slope design and adjusted as necessary to meet the specifications. Responsibility for maintenance of the final dewatering system and continued monitoring of the final slopes has not been established. The perpetual operation and maintenance of the drainage/stabilization system eventually will become the responsibility of the lot owners. The City of Oakland should be involved in the review and approval process of any

agreements between the current quarry owner and the subsequent land/lot owner(s) with respect to this system.

For the duration of the quarrying phase, it is recommended that the project sponsor establish a fence around the entire perimeter of the quarry to further discourage unauthorized access. Signs should be posted warning the public away from the edge of the quarry at any likely points of illegal entry.

A slope of 1.5:1 (one and one-half to one) with regular benches normally is the maximum permitted cut slope within subdivisions and development projects in the City of Oakland. The earth materials (soil and rock) in the cut may be capable of standing at a steeper angle, but the City Planning Staff is concerned that steeper cuts may pose personal safety hazards for adjacent residents and visitors to such areas.

The final slopes in the quarry reclamation plan would involve total changes in elevation of about 600 feet, with 18 benches at about 30-foot intervals ranging in width from about 12 feet to about 55 feet. The slope of the risers (the face of the bench) would vary from about 0.93:1, in the upper elevations of the quarry, to about 0.34:1, in the lower elevations. These proposed slopes, particularly in the lower elevations (below about +730 feet msl), exceed those normally permitted in Oakland subdivisions and development projects.

The slopes in the lower elevations continue to be a major concern to City Planning Staff because of the potential hazard to adults or children who might be attracted to the former quarry site for whatever reason (curiosity, sense of adventure, etc.). City Planning Staff recommends that the project sponsor explore possible design modifications to the proposed slopes of the risers below elevation +730 feet msl to reduce further the potential long-term personal hazards that could be posed by these slopes. Specifically, a design with less steep slopes and more frequent benches should be considered.

Once it has been demonstrated that a reasonable effort has been made by the project sponsor to provide final slope designs that address the previously expressed personal safety concerns of City Planning Staff, safety information and education could be provided to future residents to help prevent injuries when the site is fully developed. The

City, the project sponsor and the prospective property owners may agree on a program to develop and disseminate information in such a program. Prevention of access to the quarry and basin slopes during the post-operational phase ultimately will become the responsibility of the property owners. Much will depend on the final configuration of the home and building sites and upon the design and location of the contemplated regional hiking trail. It must be recognized that no security system has ever been devised that was completely successful in preventing unauthorized access to quarry sites. The quarry operators will continue their existing precautions and vigilance during the future quarrying of the site, but will not be in a position to do so once mining has ceased.

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[1] The full title of this document is California Administrative Code; Title 8. Industrial Relations; Chapter 4. Division of Industrial Safety; Sub-chapter 17. Mine Safety Orders. Latest revisions; 11 July 1981. The full text is contained in Title 8. California Administrative Code Sections 6950 through 7283 plus 2 appendices.

[2] EIP Associates, Lombard Plaza, Consultant's Report on Geology and Topography, San Francisco, 18 March 1985.

[3] Paul Visca, Associate, Golder Associates, telephone communication, September 16, 1986.

4.10 SOCIOECONOMICS

4.10.1 SETTING

Employment

Leona Quarry currently provides full-time employment for approximately 30 persons on the project site, including office and sales staff.[1] Approximately 22% of these workers live in the City of Oakland, while the remainder elsewhere in the East Bay.[2]

Secondary employment associated with project site employment totals approximately 165 workers.[3] This employment is distributed throughout the Bay Area, and is also related to other economic activities in the region. Secondary employment, for example, includes the approximately 50 drivers of trucks that haul rock and rock products to construction sites.

Revenues and Costs

Current revenues generated by the quarry operators are about $190,000 per month, and are projected to increase an average of approximately 10% per year throughout the period of quarrying activity.[4] Monthly payroll for project site workers is currently about $140,000 per month, much of which is spent in the Oakland area.

The project sponsor currently pays approximately $19,000 per year in Business License taxes to the City of Oakland. Taxes collected by the State on the sale of project site materials amount to approximately $320,000 per year, of which approximately $49,230 is returned to the City in the form of a subvention. Property taxes amount to about $74,000 per year, and while collected by the County, the total is distributed among several jurisdictions and service providers. The City of Oakland receives up to 20%, or about $15,000, of the total. Other taxes include a Federal Road Use tax of about $4,000 per year, and a State gas tax fee of less than $4,000 per year. The City receives a small portion of these tax amounts. Total taxes paid to the City that are directly related to project site activities, then, amounts to approximately $83,000-90,000 per year.

Direct costs incurred by the City consist largely of costs associated with maintenance of City streets used by trucks travelling to and from the project site. While difficult to calculate due to the heavy use of these streets, project site activities do generate some, albeit minor, street maintenance costs to the City. Other costs include police and fire

service provision to the project site. The location of the site within established service areas, and the infrequent use of such services by the quarry operators, suggest that project site activities generate minimal demands on police and fire services.

Market for Project Resources

The quarry on the project site has been in operation since 1903, providing high grade rock and rock products for construction activities in the greater East Bay area. While fluctuations within the market area have occurred over time due to the location of construction projects, the traditional market for project site products has been Oakland (accounting for about 80% of the quarry's business), Alameda (10%), and other East Bay cities (10%).[5] While fluctuations may occur in the future as well, it is expected that the market for project site products will not deviate dramatically from the pattern established over the past 76 years.

Current costs for quarry products at the project site range from $2.70 per ton for backfill material to $6.40 per ton for aggregate roadbase material.[6] Rock products at competing quarries in the East Bay are sold at prices similar to those of project site rock products. However, minimum costs to transport rock products to the Oakland market which accounts for 80% of the quarry market activity, are established by the State Public Utilities Commission (PUC). Based on a maximum load of 26.2 tons on a five-axel double-bottom dump truck, the minimum haul cost rates from various competing quarries in the region to the Oakland Airport, for example, are as follows: Leona Quarry $1.83/ton, Hayward $2.14/ton, Sunol $3.55/ton, Pleasonton $3.28/ton, Clayton $4.74/ton and Dumbarton $2.96/ton. PUC rates are considered minimum rates, while actual rates for transporting rock products from outlying areas to the Oakland market are much higher.[9] Thus, the project site quarry operators have a competitive advantage over operators in outlying areas due to relative proximity to the market, which translates into a cost savings to buyers of rock products in Oakland.

Property Values

Residences and institutional facilities (e.g., Mills College) represent the major land use activities in the project vicinity. Residential property values in the project vicinity vary widely due, largely, to variations in terrain, quality of public service provision, lot and home size, age of dwellings, and access to amenities (eg., parks and open space). The

result of this variability is compounded by the presence of I-580 and Highway 13, which physically separates the major residential areas in the project vicinity. Thus, in the Ridgemont subdivision immediately to the northwest of the project site, home values are in the \$350,000-\$440,000 price range,[10] reflecting the commanding views of the Bay Area, large lot and home sizes, and the presence of nearby parkland. On the western side of I-580 across from the project site, home values range from \$85,000-\$130,000, reflecting the older age, smaller size.

4.10.2 IMPACTS

Employment

Employment levels are expected to remain the same during the remaining 40 years of project site quarrying operations. Secondary employment would be expected to remain the same as well. No introduction of additional machinery on the project site that could displace project site workers is proposed. At the conclusion of project activities, associated jobs would be lost. As noted in the project sponsor's reclamation plan, redevelopment of the site could include both residential and employment-generating uses.[11] These non-residential activities could generate more employment than is currently on the project site, as well as different types of employment opportunities than are currently available on the project site. One potential impact, then, of the termination of project activities would be loss of jobs held by project site workers. Reuse of the site would offset this effect to some extent but would not necessarily result in a net loss of jobs on the project site.

Revenues and Costs

The current relationship of revenues and costs associated with project site activities results in net revenues redounding to the City of Oakland. It is expected that the net fiscal benefits currently experienced by the City would continue until the termination of project site quarry operations. Redevelopment of the site could introduce more intensive uses that could generate more sales, business license, and other taxes than current levels, resulting in more revenue for the City.

Market for Resources

Buyers of rock products in the market area can expect the continued availability of materials from the project site quarry for the next 40 years. After that period of time, the market area would need to be served by quarries outside the East Bay. Assuming these outlying quarries continue in operation beyond the remaining period of project site quarrying activities, and assuming that transportation technology does not change to the point that dramatically reduces transportation costs, the costs associated with transporting rock products to the project site quarry market area from outlying quarries would continue to be noticeably greater, in 1986 dollars, after project site quarry operations are terminated.

Property Values

Leona Quarry has been operating on the project site since about 1910. The overwhelming majority of residences in the project vicinity have been constructed since that time. Continued residential re-sale activity in the vicinity, coupled with on-going development of the Ridgemont subdivision, suggest that quarrying activities on the project site do not pose potentially significant adverse environmental impacts on property values in the project vicinity. Discussions with area realtors indicate that potential homebuyers rarely discuss the presence of the quarry as a detrimental characteristic of the area which would adversely affect a potential home sale.

Once quarrying operations end, the opportunity would exist to redevelop the project site. As suggested in the project sponsor's reclamation plan, redevelopment could include urban uses more compatible with existing development in the project vicinity. Should this type of development occur on the project site, it could be expected that property values in the project vicinity would not be adversely affected.

4.10.3 MITIGATION

No mitigation is required.

Revenues and Costs

No mitigation is required.

Market for Resource

No mitigation is required.

Property Values

No mitigation is required.

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[1] Tom Rolleri, Vice President, Gallagher and Burk, Inc., telephone conversation, September 10, 1986.

[2] Tom Rolleri, September 10, 1986.

[3] Secondary employment calculated using employment multiplier of 5.52. Multiplier based on information contained in the June 1986 Association of Bay Area Governments (ABAG) report, 1982 Input-Output Model and Economic Multipliers for the San Francisco Bay Region, at page 49.

[4] Tom Rolleri, Vice President, Gallagher and Burk, Inc., telephone conversation, September 18, 1986.

[5] Tom Rolleri, September 18, 1986.

[6] Les Whetstone, Dispatcher, Leona Quarry, telephone conversation, October 1, 1986.

[7] Les Whetstone, October 1, 1986.

[8] Les Whetstone, October 1, 1986.

[9] Les Whetstone, October 1, 1986, Tom Rolleri, personal communication, October 9, 1986.

[10] Renee Zimmer, Realty Agent, Ridgemont Homes, telephone conversation, September 10, 1986.

[11] Gallagher and Burk, Inc., Interim Reclamation Plan for the Leona Quarry, July 1984, page 4.

5 UNAVOIDABLE ADVERSE IMPACTS

Trucks traveling to and from Leona Quarry are restricted by local regulations in their use of I-580 and Highway 13. Due to restricted truck use on freeways, truck haul routes consist of local streets and arterials some of which traverse residential neighborhoods. Continued operation of the quarry will result in an unavoidable adverse impact on residents and businesses located on truck haul routes. Haul truck trips would cease upon closure and reclamation of the quarry, resulting in a long-term mitigation of this impact.

The continued removal of the hillside is unavoidable in the operation of a quarry. The resultant finished slopes remain a potential hazard to those adults and children who might be attracted to them through curiosity. Cessation of quarry activities at this time would result in slopes in the upper portion of the quarry that are more hazardous than those which would result from the implementation of the proposed reclamation plan.

6 ALTERNATIVES TO THE PROPOSED PROJECT

6.1 NO PROJECT

The "No Project" alternative, as defined in the California Environmental Quality Act, would entail no change in the project site as it now exists. No quarrying activities would take place, and the site would not be reclaimed. It would remain as unvegetated open space with no legal public access. Public safety impacts which could result from tresspassers entering the site would not be mitigated.

The no project scenario would result in increased costs for similar rock materials due to the greater haul distances required. Leona Quarry is the last remaining quarry in the City of Oakland; if mining activities were discontinued, the closest source of materials would be Livermore or Sunol. Regional traffic impacts would be increased.

6.2 ALTERNATIVE CONFIGURATION OF SLOPES BELOW ELEVATION +730 FEET MSL

To respond to City Planning staff concerns regarding public safety, the concept of flatter slopes in the lower elevations of the quarry is being considered. The currently proposed slopes are slown in the Cross Sections (Figures 3-4 through 3-7) that appear in the Project Description of this document. The area of concern consists of the lowest unit of the Leona Rhyolite, labeled Tl_2 in the cross sections. The top of this unit varies in elevation from about +540 feet msl (Section C) to about +750 feet msl (Section E). Between 6 and 9 benches about 30 feet apart and with risers sloping between 0.34:1 and 0.51:1 are proposed for this unit. The overall slopes in this unit would vary between 0.62:1 and 1:1.

One possible alternative configuration would be to flatten all slopes in this unit to 1.5:1 (266% slope) and double the number of benches (one every 15 feet rather than one every 30 feet). Assuming bench widths similar to those currently proposed (two at 12 to 15 feet

wide followed by a third at about 55 feet wide) the base of the final slope design would extend between about 300 feet and about 700 feet farther into the quarry.

The results of this altered design have not been examined in detail, but the following changes would be expected.

- Given an average annual production of 1,000,000 tons over a 40-year period, the quarry might close sooner because less material would be removed from the lower elevations.
- Given that the lower elevations contain premium quality rock, less concrete aggregate would be available from this source.
- Less developable land would be available in the floor of the quarry where the final design slopes were achieved.
- The entire drainage system, including the benches, risers, pipe locations, and drainage basin at the base of the quarry walls would need to be redesigned to accommodate the new configuration.
- The existing geotechnical design would need to be re-evaluated by the project sponsor's geotechnical consultant to ensure that the new configuration did not endanger the stability of the final design.

The flatter, shorter slopes would address the perceived hazard; i.e., one could "tumble or slide" down a 15-foot long, 33-degree slope with the possibility of sustaining less injury than from "falling" down a 30-foot long, 47 degree or 71 degree slope. However, the shorter, flatter slopes also would appear more accessible and could have the counterproductive effect of attracting more climbers than the longer, steeper, more imposing slopes.

7 EIR AUTHORS AND PERSONS CONSULTED

7.1 EIR AUTHORS

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 Environmental Review

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 Mark Trembley, Urban Planner
 Jennifer Toth, Landscape Architect
 Ricardo Villasenor, Biologist
 Don Dean, Planner and Transportation Analyst

Baseline, Consulting Geologists
 Yane Nordhov, Geologist

7.2 PROJECT SPONSOR

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 T.T. Rolleri, Jr., Vice President

7.3 PROJECT TEAM

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7.4 PERSONS CONSULTED

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Ron Wallace, Bissel & Karn, Inc.
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Michael Plumer, Gallagher & Burk, Inc.
Tom Rolleri, Gallagher & Burk, Inc.
Renee Zimmer, Ridgemont Homes
George T. Hart, Chief of Police
Michael Pickering, City Traffic Engineer

Appendix A

INITIAL STUDY

File No. ER 86-1
Ref. No. CM 80-425

City of Oakland
Oakland, California

INITIAL STUDY
California Environmental Quality Act

I. DESCRIPTION OF THE PROJECT CUP for continued operation of an existing quarry and approval of a State mandated reclamation plan. It is proposed that the quarry slope be ½ to 1 for a substantial portion of the lower slopes. Some planting is proposed on some of the final slopes as they are finished. The probable use of the exhausted quarry is for single family residential use. (See sections and plot plan on file and other suporting materials)

II. DESCRIPTION OF THE ENVIRONMENTAL SETTING 125 acre site which has been extensively quarried since approximately 1910. Some relatively undisturbed portions of the site and older disturbed portions of the site have oak trees and other reestablished native vegetation. The site has a major bench at approximately mid quarry where materials are apparently conveyed to the floor elevation of the quarry for sorting and shipment. Crushing may occur on the bench. A row of trees and a berm screens the quarry from the Fwy.

III. ENVIRONMENTAL EFFECTS	Yes	Maybe	No	Source or Explanation
Geophysical. Will the proposal result in:				
1. Unstable earth conditions, including erosion or slides, or changes in geologic substructures either on or off the site?	X			observation
2. Major changes in topography or ground surface relief features?	X			nature of quarry
3. Construction on loose fill or other unstable land which might be subject to slides or liquefaction during an earthquake?			X	Bldgs on good soil
4. Construction within one quarter mile of an earthquake fault?	X			ER-5
5. Substantial depletion of a nonrenewable natural resource or inhibition of its extraction?	X			loss of hillside
Air and Water. Will the project result in:				
6. Substantial air emissions, deterioration of ambient air quality or the creation of objectionable odors?	X			Localized dust
7. Substantial degradation of water quality?	X			silt in run-off
8. Changed drainage patterns or increased rates or quantities of surface water runoff?		X		as less permeable soils are exposed
9. Interception of an aquifier by cuts or excavations?		X		nature of quarry
Biotic. Will the project:				
10. Reduce the quantity of fish and wildlife in the project vicinity, interfere with migratory or other natural movement patterns, degrade existing habitats or require extensive vegetation removal?		X		suspended silt could affect fish in S.L. Bay
11. Reduce the numbers of any rare or endangered species of plants or animals?			X	
Land Use and Socio-Economic Factors. Will the project:				
12. Conflict with approved plans for the area or the Oakland Comprehensive Plan?	X			Comp. Plan
13. Carry the risk of an explosion or the release of hazardous substances, including oil, pesticides, chemicals or radiation?	X			Explosives used
14. Require relocation of residents and/or businesses?			X	Vacant land
15. Cause a substantial alteration in neighborhood land use, density or character?	X			Increasingly steep slopes
16. Generate substantially increased vehicular movement or burden existing streets or parking facilities?	X			Continued heavy truck traffic
17. Elicit substantial public controversy or opposition?		X		Knowledge of final plan
18. Have a substantial impact on existing transportation systems or circulation patterns?		X		Depends on volume moved
19. Result in a substantial increase of the ambient noise levels for adjoining areas?	X			New residents exposure
20. Impose a burden on public services or facilities including fire, solid waste disposal, police, schools or parks?			X	Nature of quarry
21. Impose a burden on existing utilities including electricity, gas, water, and sewers?			X	Nature of quarry
22. Destroy, deface or alter a structure, object, natural feature or site of historic, architectural, archeological or aesthetic significance?	X			Artificial, steep slopes
23. Involve an increase of 100 or more feet in the height of any structure over any previously existing adjacent structure?			X	Nature of quarry

Energy: Will the project:	Yes	Maybe	No	Source or Explanation
24. Use or encourage use of substantial quantities of fuel or energy?	X			Trucks & equipment

IV. MANDATORY FINDINGS OR SIGNIFICANCE (EIR required if answer to any of the following questions is "yes" or "maybe".)

	Yes	Maybe	No
a. Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	X		
b. Does the project have the potential to achieve short-term, to the disadvantage of long-term, environmental goals? (A short-term impact on the environment is one which occurs in a relatively brief, definitive period of time while long-term impacts will endure well into the future.)	X		
c. Does the project have impacts which are individually limited, but cumulatively considerable? (A project may impact on two or more separate resources where the impact on each resource is relatively small, but where the effect of the total of those impacts on the environment is significant.)			X
d. Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	X		

If any "yes" or "maybe" answers are marked, describe the specific nature of the environmental effects involved and their relationship to the project. (Use an attached sheet if necessary.) The visual quality of the extremely steep quarry slope will be degraded as the slopes are steepened and the bench lowered. The transport and sale of quarry material in the immediate future will result in a permanent visual scar on the hill. There is no feasible way of restoring the original or substantially less steep grades.

V. DETERMINATION:

On the basis of this initial evaluation:

☐ I find the proposed project WILL NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☐ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because the mitigation measures described on an attached sheet have been added to the project. A NEGATIVE DECLARATION will be prepared.

☒ I find the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

Name Franklin Ebbert(?) Date January 27, 1986

Title Senior Planner

LEONA QUARRY

APPENDIX B

	Ave Daily Loads	Ave Daily Tons	Ave Load
1984			
jan	110	2255	20.5
feb	43	807	18.6
mar	35	569	16.4
apr	44	811	18.3
may	69	1372	19.8
jun	78	1573	20.1
jul	101	2321	21.8
aug	85	1763	20.7
sep	101	2059	20.4
oct	79	1456	18.5
nov	19	1830	19.3
dec	38	576	15.3
Ave Month	67	1449	19.1
1985			
jan	55	1078	19.7
feb	62	1212	19.6
mar	27	469	17.6
apr	60	1267	21.3
may	40	648	16.4
jun	87	1792	20.7
jul	113	2199	19.5
aug	59	1133	19.35
sep	86	1719	19.9
oct	112	2317	20.7
nov	98	1762	18
dec	92	1794	19.5
Ave Month	74	1449	19.4
1986			
jan	62	1180	19.1
feb	45	807	17.8
mar	164	3595	21.9
apr	111	2348	21.1
may	84	1624	19.3
jun	102	2154	21.1
jul	278	6522	23.5
aug	423	10208	24.1
sep	325	7399	22.8
oct	300	7022	23.4
nov	314	7298	23.3
dec	177	4120	23
Ave Month	199	4523	21.7

Appendix C

Existing Zoning

U.C. BERKELEY LIBRARIES
C124920445